Role of PMI on GDP With Reference To Post GST Indian Scenario

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Abstract: Macro-economic forecasting in India became more scientific and accurate with the advent of the Purchase Manager Index, Particularly in the manufacturing sector. Since the index considers all forms of inventory build-up from the raw material purchased to final factory output, it was considered more revealing as compared to Index of Industrial production that considers only factory output. The monthly data of PMI is more indicative of the future outlook for the manufacturing sector and the country's GDP and renders prediction easy and precise. This study explores the pattern of secondary data drawn from PMI and IIP over a period of eight quarters to forecast GDP of India by forecasting PMI. The presuppose link between PMI and GDP is leveraged to anticipate -possible GDP for FY 2018-19 using multiple regression and time series method. The study revealed a strong positive relationship between GDP and PMI but surprisingly none- to- close relationship between IIP and GDP.

Index Terms: Gross Domestic Product, Goods and Services Tax, Index of Industrial Production, Purchase Manager Index.

I. INTRODUCTION

The Brick and Mortar economy model has agriculture as the foundation with industrial and service sectors aiding growth and progress. The Brick and Mortar model refers to a traditional street side business where the customers and the company / owners deal with each other face to face. As the stage of development gathers momentum, the contradiction of agriculture comes down and is compensated by the growth in industrial output and its contribution to GDP as was witnessed after industrial revolution. Service sector growth is a matter of compelling necessity on account of sweeping changes and reforms in financial sector, telecom, and other services on account of liberalization and globalization. This tends to minimize the role of core and manufacturing sector as contributors to economic growth but it enhances the pace of overall growth for a country as is witnessed in India since 1991. Technology and technology enabled services have been engines of growth during the first decade in the new millennium. This was followed by other services from the financial and telecom sector since the Internet of Things (IOT), online services and shopping as well as breakthrough in the form of digital disruption sweeping across the world. However, the fact still remains that the growth of a nation hinges not only on services but also on core sectors such as mining, minerals, metals, manufacturing, construction and physical infrastructure. There has been a lot of value created

by these companies for the last two decades both by organic and inorganic growth. However, there is a dominant Government presence in minerals and mining space but PSU's are outside the purview of PMI, which considers only large manufacturers for the purpose of computing Index. Hence it is essential to keep track of the growth trajectory in manufacturing sector by monitoring a relatively young index popularly known as the Purchase Manager Index (PMI) in India.

According to Business standard 2018 the PMI has been almost stagnant during post implementation of GST justifying the slowdown in manufacturing particularly in the SME segment as a result it is predominant to examine the effect of PMI on GDP in conjecture with IIP.

II. JUSTIFICATION FOR THE STUDY

In the light of global economic slowdown and its consequent ripple effect on other economies such as India and China, it is imperative to predict the momentum particularly in manufacturing sector. Since entities declare the results every quarter, the investors may have to wait for three months before they can make any judgment about the performance of these entities but there is also a monthly release of data by the Confederation of Indian Industries (CII) and the purchase manager index data which can become credible pointers to the possible growth or de growth in manufacturing. This study attempts to predict the positive or negative changes in growth, in select manufacturing sectors by closely monitoring the PMI. This may well serve as crucial economic indicators to predict possible outcomes from the manufacturing sectors.

The strong relationship between PMI AND GDP in the United states is on account of the comprehensive nature of the Index subjected to all sectors and sizes. The matured nature of the economy also encompasses all aspects of business activities including future order book for output. On the other hand, PMI in India is in the nascent stage and it is constructed through the survey of 500 large business units, leaving out PSU's and SME's. This is bound to prejudice the outcome because the omissions have more contributions to the GDP. Hence ,It is vital to analyse the data for possible relationship between PMI, IIP and GDP.

III. SCOPE OF THE STUDY

The study tries to establish a relationship between PMI and GDP and also tries to project the same into the growth of the sourcing companies. The outcome of the study may help key policy decisions such as decision on interest rates, rationalisation of tax rates or for any other policy changes to improve growth or safe guard against possible uptrend in inflation due to the overheating of the economy. Further it is possible to

undertake a long term forecast based on trend projections of the two important indicators PMI and IIP.It may also become handy in formulation of annual union budget to estimate fiscal and revenue deficit to plan the resources accordingly.

IV. OBJECTIVES

1.To examine the impact of PMI on GDP by exploring the relationship between PMI and GDP growth 2.To Forecast probable GDP using time series.

V. METHODOLOGY

This study is exploratory in nature and attempts to predict manufacturing growth by monitoring IIP and PMI to forecast GDP. It is based entirely on secondary data drawn from published sources like journals, periodicals and websites. The study uses statistical tools like Multiple regression and time series method for the purpose of analysis and interpretations.

VI. LIMITATIONS OF THE STUDY

This study is handicapped by the following limitations:
☐ It is confined to only select manufacturing sectors and does not cover all the other sectors as they do not form part of the PMI.
☐ It takes into account only listed entities for the purpose of analysis and excludes SMEs in the same sector.
☐ It tries to track growth only by monitoring CII & PMI and does not consider other macroeconomic aspects such as aggregate demand interest rates and inflation.

VII. REVIEW OF LITERATURE

A. Pmi As An Indicator Of Manufacturing Activity

"The nature of markets" ,2017,gives us an idea of how the PMI data is also an indicator of the manufacturing activity. The PMI data is also known as the ISM manufacturing index. Member groups contain 300-400 large US multinationals and big concerns. The PMI data is important as it represents 20% US GDP and is more accurate indicator of the economic activity. New order data is acquired from the PMI index or survey. When the PMI number is greater than 50, then new orders pile up. If the number is lesser than 50, the orders are dwindling. The bigger the PMI number indicates the speed of the order arrival. The rise or fall over a series of month is an indicator of trends. Sector breakdown is not a concern for the bond and currency traders. Inventories release measures the status of inventories at manufacturing firms. A number below 50 implies contracting inventories and lower the number indicates a faster speed of contraction. Any number above 50 indicates the increase in the level of inventories and higher the number depicts a faster inventory build-up. When the demand is high from the consumer side the company wishes to sell shares as they can't keep up with the consumption and hence price raise can be expected due to demand and currency appreciates. The price index provides information on prices charged by manufactures. When the number is higher than 50, there is a price rise and lower than 50 indicates fall in prices. Export index records the state of export markets of manufacturing firms. Order accumulation is expected when the number is greater than 50 and falling orders at a number lesser than 50. This also sheds a light on the import data of manufactures. When the import demand is high the

manufacturing sector is said to be more after. This can provide an idea of the economic dynamism of the manufacturing sector. The PMI report also gives information on the lead times of manufacturing. We can identify the capacity constraints and efficiency. Lead time is the time between the receipt of the order and the completion of the job with inclusion of the delivery .

B. The Cruciality Of Pmi Data

"The importance of purchasing managers index",Elvis Picardo,2016,sheds light on the PMI data's cruciality. PMI survey gives detail of inventory level, employee requirement etc. The data helps in predicting the shape of economy and also the strength or weakness of the currency. The PMI survey gives a lot of indexes like inventory release, price index, and export and import orders, which are important to the manufacturing sectors and investors. PMI above 50 indicates expansion or growth in the manufacturing sector, whereas a number below 50 is an indication of fall in the manufacturing sector. The Federal Reserve and even other central banks use the outcome of PMI surveys while determining monetary policy. There is an ISM business survey committee that has a series of industries. The industries are varied by the North American Industry Classification System (NAICS) and are mainly on every industry's involvement to US GDP. There are 10 business activities whose monthly changes are identified by the members through a questionnaire. They are new orders, production, employment, prices, and backlog of supplier deliveries, orders, inventories, customer inventories, fresh export and import orders. The data is collected every month beginning. Respondents wait till the month end to get a clear picture of current business activities. The PMI is a complex index based on equal weights (20%)
regarding the five primary sub-indices. The indexes are production, new orders, employment, supply inventories and deliveries. Based on 20% of the weight of each sub index, the PMI data is calculated. This shows the PMI is an important factor for the manufacturing sector in particular[1].

C. Prediction Of Gdp Taking Pmi Data

ICRA bulletin, 2015, Money and Finance by Suchismita Bose sheds a light on how the PMI data can be used to predict GDP. In the recent trends the manufacturing sectors are the main contributors to the Indian economy. PMI data being issued every month is a timely indicator than that of the official gross domestic product data. Furthermore, the articles from Trading Economy states that PMI is widely used asses and forecast the economy this also influences financial markets and also the stock markets PMI is a diffused index by design. The articles deal with the U.S and China's economy. We can correlate to these economies as they are similar to that of our Indian economy. The population and industry contribution of these three countries are similar. The PMI based models help in forecasting a probable GDP. The PMI data even though not accurate in prediction, still does have some minor link to the GDP. The dip in the PMI data shows a dip in the GDP data for the same period. The PMI along with other indicators like IIP do help in the forecast of the GDP data. The GDP data is an

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[1]
https://www.investopedia.com/articles/investing/010914/importance-purchasing-managers-index-pmi.asp

accumulation of many other factors. PMI data need not be used as an individual component to help calculate the GDP. The PMI data is collected from countries all over using similar methods and hence can be used for comparisons with other nations as well. PMI can also be used as a trusted source as the data once published will not be altered along the way. Other studies also have suggested that the PMI data has predictive nature of the GDP not only in the employment, sales and industry production but also other aspects. Even though the PMI data is not currently popularly used by the people in the analysis part, they are soon to catch up. This could be because many industry people are not aware of the benefits of the PMI data and its forecasting ability which can help in investing options and also the demand and supply along with pricing[2].

DanZhang MinXiao Xiaopeng YangYueHe, 2015, analysed the relationship between PMI and GDP where the manufacturing PMI of the US and Japan but not the case in China. Z Kilinc,2016 also emphasized the threshold of PMI on GDP.

D. Impact Of Manufacturing Sector On The Gdp

Dhiraj Jain,2017,indicated that the manufacturing sector has contributed less when compared to that of the service sector. One of the main reasons for this is mainly because of foreign direct investment. Due to this, the service sector is flourishing and there is more contribution. Another article publish by Frost & Sullivan about the impact of the manufacturing sector on the Indian market, shows that the manufacturing sector should have contributed more than what it has been performing. The percentage contributed by the manufacturing sector is around seventy percent and the expected value is around twenty five percent. This level is low when compared to other nation's manufacturing sector contribution to the GDP. The service sector happens to be the main contributing factor to the GDP which is followed by the industry sector. The agricultural contribution is steadily declining. These may be due to the inefficient policy implementation by the government by creating norms that hinder the growth. The Make in India policy expects to boost the manufacturing sector's contribution to GDP. There is a slow incline in the contribution even if not major, is expected to change in the near future. All the studies and articles show that the manufacturing sector's contribution is not up to the expected level and should grow over the years. India being an agriculture based country has also seen a decline in that sector's contribution. India's manufacturing sector mostly comprises of the small and medium scale enterprises. These companies have to be financially sound and many policies like the export import duties sometimes hinder their growth. Furthermore, taxes like GST have helped the SMEs to bring all the indirect taxes that they have to pay under one section and helping in implementation of the new business in India. This will also help them compete with the global players and which in turn increase their share in the GDP and also provide employment[3].

E. Linkages Between The Pmi, Manufacturing Growth And Gdp Growth

Madan sabnavis,2017, on "Linkages between PMI, GDP growth and IIP growth", stated that the IIP number is an important indicator for the economic strength analysis along with the GDP and the PMI data. Any reading above the limit of fifty means the market is expanding compared to the previous month's result. Similarly, any reading below represents a fall in market or so called contraction of market. There exists no change in market when the reading is stagnant at fifty. PMI not necessarily reflect in the GDP data. This may be due to the fact that the GDP is given out in quarterly and the PMI data is given out monthly and the PMI has to be converted to quarterly data. The study shows a weak relationship between the PMI and GDP in the manufacturing sector but not so in the service sector. The relation between the PMI and GDP are strong in the service sector. PMI and the IIP data have a weak but a good link between them. It will be better to take the service sector too into consideration while the GDP is formulated for better results. Another article by Habanabakiz Thomas published in International Journal of Economics and Finance Studies gives us an insight into the African economy. They try to form a relation between the employment, GDP and PMI (manufacturing). Even in their study they have shown that there doesn't exist a prominent link between the PMI and economic growth as there are some discrepancies. This in turn reflects on their employment growth. They suggest that the PMI data may be a better indicator for other macroeconomic indicator like the inflation. The articles all come to one main result wherein the link between PMI and GDP is not strong enough but is moderate and any increase in PMI need not be an indicator for the GDP growth. It also states that the IIP of manufacturing has a good link with the PMI and also the GDP published[4].

VIII. DATA ANALYSIS

Multiple Regression is used with SPSS 24 to find the effect of PMI and IIP on GDP. This is mainly to Extrapolate the amount of accountability of PMI and IIP to explain the GDP. Predictors: PMI, IIP, Criterion: GDP

Table 1:R square

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.515[a]	.265	.250	.560	1.706

From table 1,it was found that coefficient of determination is 26% and data were free from auto correlation proven by Durbin-Watson test.

Hence it was proceeded by validating Model fitness using ANOVA by the following table.

[2] https://pdfs.semanticscholar.org/271a/b06e70d5d700d89ae9d61047e8db31e5e224.pdf

[3] https://www.scmspune.ac.in/chapter/2017/Final%20Copy%20of%20Journal.pdf

[4] http://www.careratings.com/upload/NewsFiles/Economics/PMI%20GDP%20IIP%20Relationship.pdf

Table 2:ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.975	2	5.487	17.489	.000[b]
	Residual	30.435	97	.314		
	Total	41.410	99			

From Table 2, it was found that model 1 was fitted at 100% confidence level hence data could be taken forward for the further analysis

Table 3:Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.534	2.995		1.180	.241
	PMI	.300	.071	.450	4.246	.000
	IIP	-.098	.017	-.614	-5.802	.000

Multiple Regression Equation:

$$Y(GDP)=3.534+0.3^{**}(PMI)-0.098{**}(IIP)----------(e1)$$

In addition to the statistical evidence shown above, there is also economic data in line with the above table reproving the effect of PMI and IIP on GDP for the period under review.

From the above equation e1 it was noted that every single unit of increase in PMI induces 0.3 units of increase in GDP and therefore it was proven that PMI is the major driving force to improve GDP. At the same time surprisingly every one unit increase in IIP drags GDP to 0.098 units. Inspite of a positive optic in PMI there has been a decline in IIP in the core manufacturing sector. This is the result of the negative impact of demonetisation since November 2016 and the implementation of GST from 1st July 2017.The following might be the major triggering factors,

1. The cash crunch and the teething problems in migrating to the new indirect tax structure badly impacted the SMEs to account for almost 30% of both PMI and IIP.

2. The inventory builder could not be off loaded also an account of the falling demand and the inability of small traders to embrace GST within a short period of time. Henceforth the negative result from IIP is purely cyclical in nature and is bound to be corrected in subsequent quarters as was evidenced in last quarter of 2017.Infact both IIP and GDP rose significantly during this period(IIP 5.8% and GDP 6.8% in last quarter of 2017-18,FY 2017-18.

Table 4: Forecasting PMI and GDP using Time series method

MONTH	PMI	IIP
Jan-16	51.0000	120.0000
Feb-16	51.0000	118.0000
Mar-16	52.5000	123.9000
Apr-16	50.4000	117.2000
May-16	50.9000	121.9000
Jun-16	51.7000	120.5000
Jul-16	51.9000	120.2000
Aug-16	52.6000	117.8000
Sep-16	52.1000	124.9000
Oct-16	54.5000	126.5000
Nov-16	52.3000	119.4000
Dec-16	49.6000	122.9000
Jan-17	50.4000	115.1000
Feb-17	50.7000	113.7000
Mar-17	52.5000	126.2000
Apr-17	52.5000	117.8000
May-17	51.6000	120.4000
Jun-17	50.9000	105.8000
Jul-17	47.9000	107.3000
Aug-17	51.2000	111.4000
Sep-17	51.2000	107.5000
Oct-17	50.3000	105.5000
Nov-17	52.6000	110.1000
Dec-17	55.0000	113.9000
Jan-18	51.5627	117.0898
Feb-18	51.5921	117.0292
Mar-18	51.6204	117.0263
Apr-18	51.5510	116.3887
May-18	51.6039	116.4102
Jun-18	51.6383	116.2396
Jul-18	51.6490	116.1916
Aug-18	51.6629	116.2580
Sep-18	51.6362	116.3201
Oct-18	51.6677	116.4122
Nov-18	51.5634	116.5761
Dec-18	51.5766	117.1656
Jan-19	51.8058	117.5381

The above table 5 has been extrapolated to forecast the results for both PMI AND IIP till Jan 2019. The results revealed a marginal rise with minor aberrations over the period of forecast. Particularly the impact of PMI on IIP is rather negligible although the economic recovery in terms of GDP growth was witnessed during the last quarter of FY 2017-2018.This is essentially on the account of pull down effect caused by sluggish growth in PMI and IIP Since January 2016.This can also be attributed to the negative effects of demonetisation and GST roll out. However, this is likely to be very short lived as there has been significant improvement in the process of GST management in the last two quarters ending 30th June 2018.It is quite, likely that the trend may reverse by early 2019.

IX. FINDINGS SUGGESTIONS AND CONCLUSION

The use of PMI for publishing relevant data has been of recent origin in India. A detailed analysis of this data would generally point to the possible direction of growth as reflected in the IIP. This in turn is bound to reflect in quarterly GDP data with particular reference to manufacturing. Hence the study attempted to link these three for a possible prediction of GDP given the PMI data. However, while PMI and IIP numbers are published every month, the GDP data is published once in a quarter. So this requires an element of aggregation at the PMI and IIP levels to draw a relationship and inference between these two sets of numbers and the GDP numbers. This attempt led to an elaborate analysis of data for a period of twenty four months for PMI and IIP and the corresponding 8 quarters for the GDP. The results of this analysis are summarised as findings below.

F. FINDINGS

a. The twenty four month PMI data reveals that it has been hovering around 49-53 % except a mild aberration when it went up to 54.5 % in October 2016.

b. The major components such as price index, new orders, supplier deliveries, inventories, employment and production have all shown more or less stable trends that reflected not only in the IIP numbers but also in the GDP data.

c. The inventory build-up in manufacturing is a clear indication of anticipation about possible future demand for a product. Inventory build-up in a month is likely to take between 30 and 60 days to off load and the same is also reflected in the GDP data.

d. GDP numbers for September quarter of 2017 was lowest at 5.8% taking everyone by shock and surprise. However the indication for the same was very visible in the PMI data of July August and September that were just around 49%.

e. Similarly the GDP growth of 7.2% in the December quarter in 2017 was also the result of the PMI builder in October November and December in 2016 at around 53%.
Similar trends were also noticed in manufacturing data from the IIP during the periods mentioned above.

f. The IIP is the first step where the PMI data is translated into industrial output and growth. This is clearly brought out by the manufacturing data which should be more or less in line with the PMI data.

g. For example, a high inventory build up in PMI will translate into high factory output in the IIP for the same month or the month succeeding. Similarly, the consolidate IIP numbers for three months would more or less be reflected in the GDP numbers as far as manufacturing is concerned.

h. These linkages have been established through correlation analysis between the IIP, GDP and PMI data.

i. The results reveal that there is a moderate degree of positive correlation PMI and IIP and elevated degree of correlation between PMI and GDP.

j. It is also relevant to note from the analysis that all the eight quarters that are under observation disclosed a similar pattern when the initial PMI data was first compared to IIP and later with GDP numbers. Interestingly this also coincided with the interest rate cycles although it was not part of the study.

k. The reluctance of the monetary policy committee of RBI to bring down interest rates even after consumer price index or retail inflation came down to 5% and less, first reflected in a near stagnation in PMI and a similar glut in IIP and GDP numbers particularly during the second and third quarter of the calendar year 2016 and also in the second quarter of 2017.

l. Similarly another noticeable feature of this analysis was the build-up in PMI during the last quarter of the financial year and the dip in the immediate quarter following.

m. This may be due to company's desire to show better results for the last quarter as a result of which they dragged down the output and revenue of the next quarter to the current quarter.

G. SUGGESTIONS

a. It would be interesting to particularly watch data from the all manufacturing units in order to predict possible sales in the future.

b. It is also suggested that every component of PMI data including the price index be monitored carefully so that it may even be possible to predict inflation in the near future. An uptrend in price index is more likely to result in an uptrend in inflation. Hence predictability is possible by monitoring PMI.

c. It could be a good idea to bring out PMI data for service sector also by using relevant set of parameters to measure the sectoral growth. This would facilitate a more accurate GDP forecast for every quarter.

d. The government may also consider release in GDP data month wise so that all the three indicators have the same interval for the purpose of analysis and interpretation.

e. It would also be a good idea to release inflation adjusted price index in the PMI that would provide better clarity for economists and analysts.

f. The index of industrial production also analyses mining and minerals output every month so PMI should also cover this sector for better acceptability.

g. It would also be relevant to move away from fixed based indexing to chain based indexing for the purpose of publishing crucial economic data.

h. This would naturally make adjustments for possible price inflation which is either cost push or demand pull. This may minimise the need for giving inflation adjusted prices as an annexure to the data.

H. CONCLUSION

India is well and truly on the run way taxing at great speed for a smooth and great take off. Several initiatives like liberalising the norms for FDI, promoting the Make in India concept and consistently trying to improve the ease of doing business in India have all been aimed at moving to the next level of mass production that is the final indication of economic development according to WW.Rawstav. All the key indicators such as the PMI, IIP and the GDP data are all meant to provide the needed information for economists and planners to evolve policies that would favour a given economic condition. For example, the inclining PMI may mean high inflation or an ascending PMI may indicate rapid growth and this should encourage the Reserve Bank

to bring about more liquidity in the system by reducing either the repo rate or the CRR for better results. The economists and analysts have also predicted a GDP growth of 7.5 -7.8 %for the financial year 2018-2019, signalling the possible moment in growth in the near term. Hence it would be a good idea to use PMI and IIP data for projecting the future trend by using the trend analysis or multivariate regression analysis for the long run. This would help the government in formulating growth friendly policies and aim to achieve the much needed inclusive growth that can pull millions of people above the invisible poverty line. A country that grows at double the world average is a clear sign of acceleration and it can improve its performance with better global growth for which there are enough indicators from the west and the Asia Pacific region. This would assure the attainment of the long cherished goal of double digit growth and become the third largest economy in the world with a GDP size of 19.05 trillion as predicted by the Price Walter Cooper report submitted to the world economic forums submitted in the March 2017. Elvis Picardo,2017,mentioned the importance of PMI on GDP.

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