

STUDY OF THE IMPACT OF MACRO ECONOMIC VARIABLE & THEIR ROLE AS AN INDICATORS FOR THE S&P CNX NIFTY

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ABSTRACT

In the present scenario of the world financial market, there seems to be stock exchange in almost every country expressing the financial health of the respective economy. This study investigates the nature of relationship between nifty index and key macro economic variable. In spite of this tremendous expansion of world trading, the basics of the market have remained more or less the same. Stock exchange index like any other index follows a cycle or set pattern of flow. This economic cycle have been analyzed with the help of the leading and lagging indicators with respect to the trends in the financial markets. In this study a comprehensive analysis has been done to qualitatively compare the S&P CNX Nifty with major macro economic variable like GDP, inflation, Exchange rate, industrial production, foreign institutional investment, unemployment, crude oil, gold price. Thus the entire variable contains some significant information for the prediction of the index. The study reveals the volatility of stock index is not only the result of the behaviour of key macro economic variable but also one of the causes of the movement in other macro aspect in the economy.

Keywords: Business Cycle, GDP, Indicators, Exchange rates, Interest rates

INTRODUCTION

The term business cycle (or economic cycle) refers to economy-wide fluctuations in production or economic activity over several months or years. It is the periodic but irregular up-and-down movements in economic activity, measured by fluctuations in real GDP and other macroeconomic variables. The complete cycle pertains to two or three years, it represent the transfer of stocks from the public to intelligent investors at the low price and re-transferred to the public at higher price and return those stocks to the intelligent investors at the low price again. So the intelligent speculators are stronger , they have the stocks as well as the public money and poor old public the lambs must grow out and grow a new fleece.

TYPES OF INDICATORS

An indicator is anything that can be used to predict future financial or economic cycles. Typically there exist three types of indicators, based on the predictions they make:

- ❑ **Leading:** these types of indicators signal future events. For example bond yields are thought to be a good leading indicator of the stock market because bond traders anticipate and speculate trends in the economy.
- ❑ **Lagging:** These types of indicators follow an event. The importance of a lagging indicator is its ability to confirm that a pattern is occurring or about to occur. Unemployment

is one of the most popular lagging indicators. If unemployment rates are rising, it indicates that the economy has been doing poorly.

- ❑ **Coincident:** These indicators occur at approximately the same time as the conditions they signify. Rather than predict future events, these type of indicators change at the same time as the stock market.

DIRECTION OF INDICATORS

Direction of indicators defines how an economic quantity is related to economic fluctuations. The possible directions of indicators can be classified as:

- ❑ **Pro-cyclical:** Any economic quantity that is positively correlated with the overall state of the economy is said to be 'pro-cyclical'.
- ❑ **Counter cyclical:** Any indicator that works against the cyclical tendencies in the economy. That is, countercyclical indicators are ones that cool down the economy when it is in an upswing & stimulate the economy when it is in a downturn.
- ❑ **A cyclical:** An indicator which does not exhibit any relationship between the two variables. They behave in an ad-hoc pattern to general economic trends. Over time, there is a substantial linkage between economic growth and the performance of financial markets such as the stock and bond markets.

One rule to follow is that after correcting for short-term volatility, the stock market will follow the economy. However, there is one critical point to emphasize: **the stock market will respond to where the economy is going, not to where it has been.**

The above statement means in order to judge where the stock markets are going; we have to understand where the economy is headed. If the economy is headed to an inflationary trend, the markets will factor in economic policy that will slow economy growth. On the other hand, if the economy is currently in

recession, the stock market will anticipate a recovery before it actually happens, and the stock prices will increase before the recession ends.

OBJECTIVE

The objective of this paper of this paper is to study the role of these seven macro economic variable in relation to Nifty, how these variables can be used to predict the movement of the Nifty Index and to which categories of indicator these macro economic variables belongs.

METHODOLOGY

The Proposed Process

It is generally believed that stock markets move in tandem with economy performance. As a result there exist leading or lagging indicators to stock markets index performance. An understanding of the leading or lagging indicators would help us predict the future course of the stock exchange.

In order to validate the above theory, we compare the performance of the NSE index (NIFTY) with respect to macroeconomic variables such as GDP, Inflation, Exchange Rates etc. over a period of 12 years (1997-2009). The analysis helps us better understand the correlation between economic variable & market performance, while identifying & classifying indicators into leading, lagging & co-incident categories.

The Mathematical Model

Mathematically the relationship between stock market performance & the economy can be traced using multiple regressions. For this purpose we need to regress %GDP (or any other macroeconomic factor) on past values of %NIFTY lead by a period 3/6 quarters.

$$\%GDP = a + b(\%NIFTY1) + c(\%NIFTY2) + \dots + f(NIFTY5) + g(\%NIFTY6) + e$$

Using the above regression line for analysis we can determine the actual period of lead or lag depending on t-Statistic & Estimated Coefficient variable derived. The analysis also requires setting of a confidence interval, which is usually taken as 95% for similar calculations.

Limitations

The above mathematical model is applicable when quarterly data is available for macroeconomic variables & stock market performance. However due to unavailability of actual quarterly data for macroeconomic variables for the period 1997-2009, we were unable to conduct a detailed mathematical model testing.

Methodology Used

Keeping in mind the limitations faced above, a visual method of observation through graphs

& mathematical trends is used in order to conclude if a given variable is a leading or lagging indicator to the stock market performance. In gold price comparison we will use Granger causality test with the data ranging from 2002-2011 to prove that there is no cause and effect relation ship between them.

EMPIRICAL ANALYSIS

Macroeconomic Variable Indicators: GDP vis-à-vis Nifty

GDP (Gross Domestic Product) is the measure of a country's economic performance. It is the market value of all final goods & services made within the borders of a nation in a year. GDP acts as a measure of total economic production for a country. The GDP reflects the health of the economy & estimates of GDP affect stock markets.

The graph below shows the relationship between stock markets & GDP growth rates

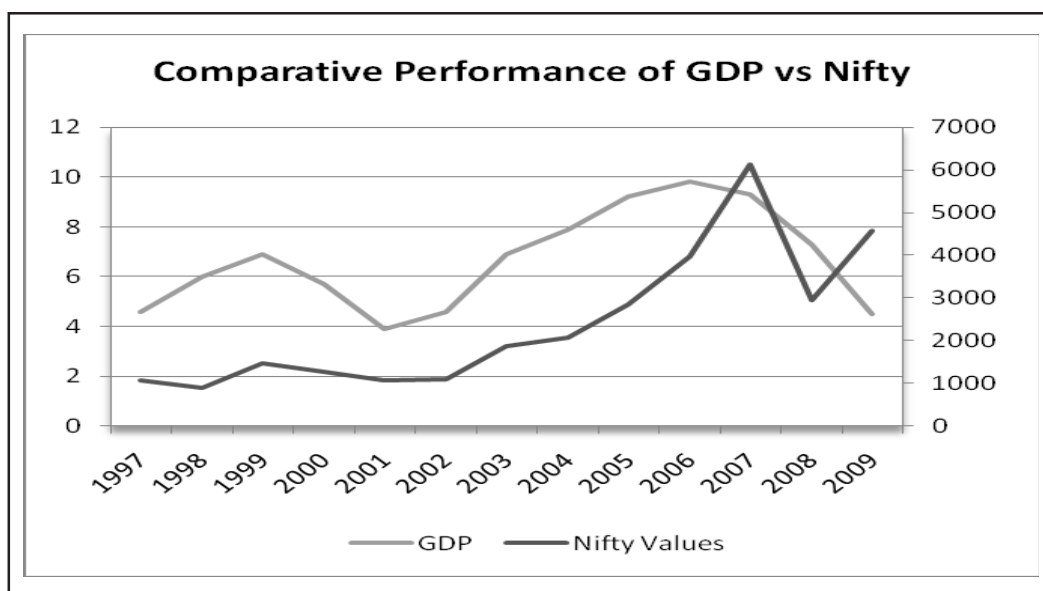


Figure – 1: Comparative Performance of GDP vs Nifty
(Source: Statistics from International Monetary Fund database)

We observe that GDP rates seem to be *leading indicators* for the stock exchange index. Further by its nature the association of GDP with Nifty index is *pro-cyclical*. This implies that a rise in GDP will lead to a rise in the stock exchange index. Therefore GDP can be used as a lead indicator to forecast the future trend of the stock exchange.

This analysis can also be justified if we consider that stock prices are the present discounted value of the future stream of expected dividends, an increase in anticipated economic activity and hence earnings & dividends should be associated with a boost in the stock market.

Likely impacts on Financial Markets

- ❑ **Interest Rates:** Unexpectedly high quarterly GDP growth is perceived to be potentially Inflationary if the economy is close to full capacity; this, in turn, causes bond prices to drop and yields and interest rates to rise.
- ❑ **Stock Prices:** Ambiguous. On one side higher than expected growth leads to higher profits and that's good for the stock market. On the other, it may increase expected inflation and lead to higher interest rates that are bad for the stock market.
- ❑ **Exchange Rates:** Larger than expected GDP growth will tend to appreciate the exchange

rate as it is expected to lead to higher interest rates.

However, one subject of conflict arising here is that GDP numbers are released four times a year & reflect past performance. For example, the second quarter GDP numbers reflect the growth of GDP in the months of April, May & June. However these numbers are issued only in August. Therefore it can be argued that GDP is a lagging indicator. A counter argument is that the market factors into account the growth rate prevalent in the economy through individual company performance & does not completely rely on official GDP numbers released by the government.

Inflation vis-à-vis Nifty

Inflation refers to a rise in the general level of prices of goods & services in an economy over a period of time. When price levels rise, each unit of currency buys fewer goods & services; consequently inflation is the erosion in the purchasing power of money. A moderate inflation is generally a good sign of economy, inducing the stock markets to go up. However high inflation creates uncertainty about future inflation rates thereby discouraging investments & savings. This in turn causes stock markets to react negatively & consequently fall

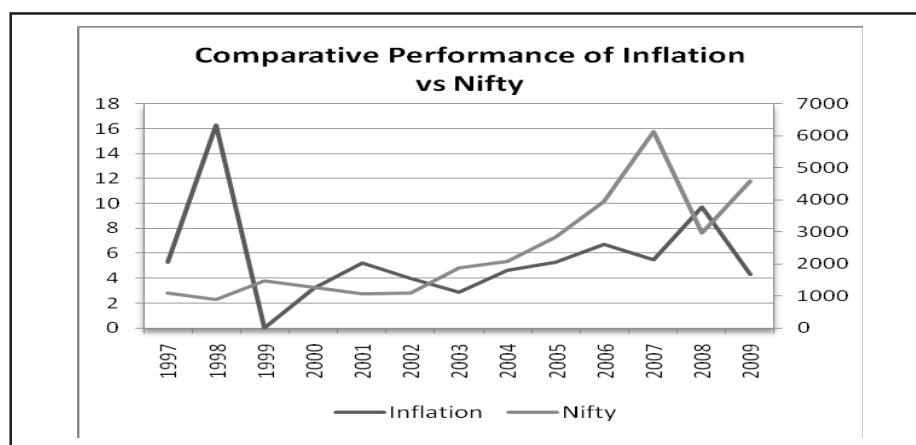


Figure – 2: Comparative Performance of Inflation vs. Nifty
(Source: Statistics from International Monetary Fund database)

As seen from the graph above, inflation is a **co-incident indicator** for the stock exchange index. Moreover it tends to move in a **counter cyclical** nature, i.e. rise in inflation causes stock exchange index to fall. However the vice versa does not necessarily hold true, as inflation rates are ideal within a given range & any fluctuation above or beyond the given range is negatively taken by the markets.

Likely impacts on Financial Markets

- ❑ **Interest rates:** larger than expected quarterly increase in price inflation or increasing trend is considered inflationary; this will cause bond prices to drop and yields and interest rates to rise.
- ❑ **Stock Prices:** Higher than expected price inflation is bearish on the stock market as higher inflation will lead to higher interest rates.
- ❑ **Exchange Rates:** High inflation has an uncertain effect. It would lead to depreciation

as higher prices mean lower competitiveness. Conversely, higher inflation causes higher interest rates and a tighter monetary policy that leads to an appreciation.

From the graph, we observe that high inflation rates in 1998, we corresponded by a decline in the stock market performance. Conversely a moderate inflation in 1997, lead to a significant rise in the stock market performance.

Exchange Rates vis-à-vis Nifty

The exchange rate between two currencies specifies how much one currency is worth in terms of the other. It is the value of a foreign nation's currency in terms of the home nation's currency. Depreciation in the local currency leads to increases in stock market prices in the long run. Where as in the short run it reduces stock market returns. This finding is especially true where the stock market is located in a highly export driven economy.

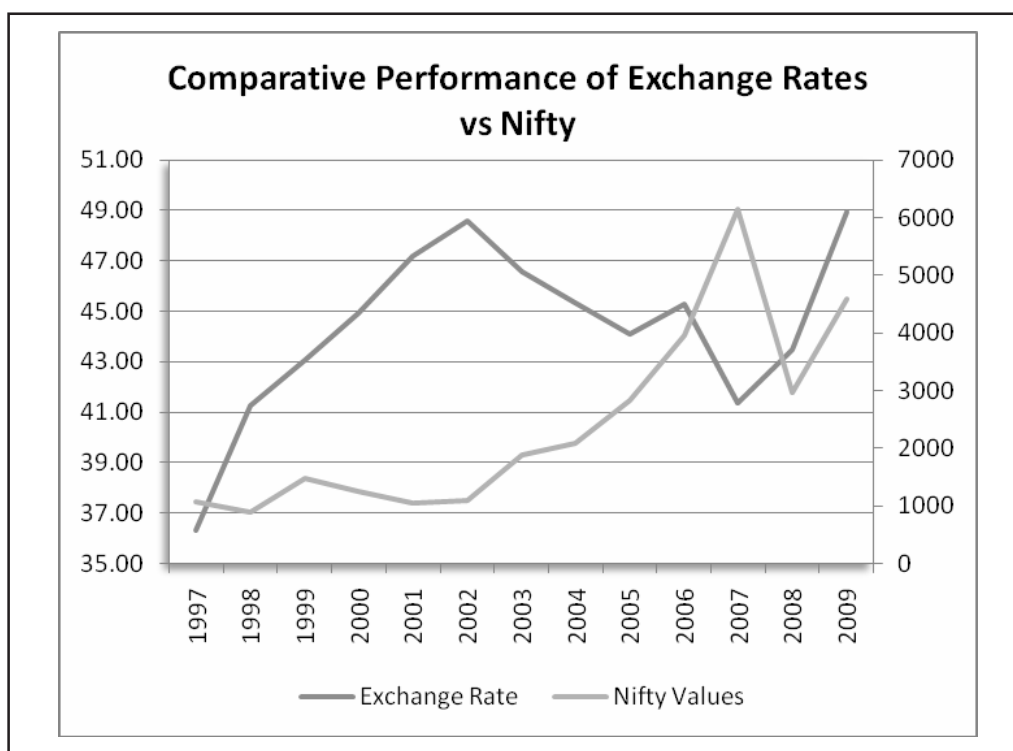


Figure – 3: Comparative Performance of Exchange Rates vs Nifty
(Source: Statistics from Handbook on Statistics India, RBI)

The graph above indicates that exchange rates are **Co-incident Indicators** to the stock exchange performance. This indicates that a change in exchange rates is immediately reflected in stock exchange performance & there exists no time lag between the two. Also as seen in the graph the nature of relationship between exchange rates & Nifty rates is **Counter-Cyclical**. This is evident when we consider that a significant portion of investments in the Indian stock exchange are a result of Foreign Institutional Investors (FII's). These investors would be highly affected by foreign exchange rates, implying that a rise in home exchange rates will be reflected by lesser money being invested in the stock exchange & consequently a fall in the stock exchange index. The time lag observed in this scenario would be nearly insignificant because investments are made

taking into account real-time information available.

An example to support the above view is the period of November 2003 to February 2004, where there was an unambiguous upward trend in the US stock market, caused by the depreciation of the US Dollar against all major currencies.

Index of Industrial Production (IIP) vis-à-vis Nifty

The industrial production index measures the physical volume of output of the nation's manufacturing sector, including factories, mines, and utilities. Good producing industries account for about 45% of the economy, the balance being accounted by service & construction industry. The index is expressed as a percentage of production in a base year.

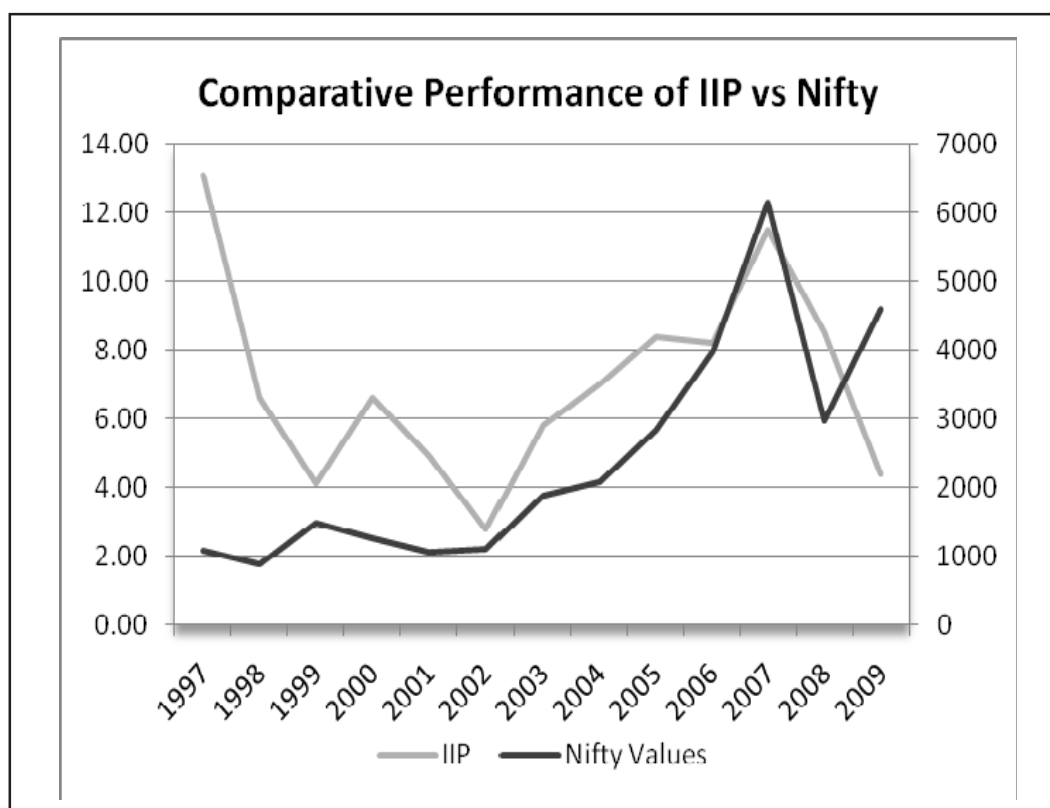


Figure –4: Comparative Performance of IIP vs Nifty
(Source: Statistics from Handbook on Statistics India, RBI)

The graph above indicates that the index of industrial production is **Co-incident Indicator** to stock exchange performance. Besides the nature of the relation is **Pro-Cyclical**, indicating a rise in IIP causes a rise in stock exchange index. If we plot the month-wise graph of IIP & Nifty, we will observe that the February IIP index of 8.6, which was far better than market expectations helped the market soar by 0.95% in spite of a strong bearish sentiment. The reason for the above relationship can be explained by the fact that higher production translates into better performance of the economy which in turn is reflected in its stock prices.

Likely Impact on Financial Markets:

- ❑ **Interest Rates:** Larger than expected monthly increase or increasing trend is considered

inflationary, causing bond prices to drop & yields & interest rates to rise.

Foreign Institutional Investors (FII) Investments vis-à-vis Nifty

A Foreign Institutional Investor or investment fund is from or registered in a country outside of the one in which it is currently investing. FII's are allowed to invest in primary & secondary capital markets in India through the portfolio investment scheme (PIS). Under this scheme, they can acquire shares/debentures of Indian companies through the stock exchange in India. Foreign institutional investors have made a sizable investment in Indian financial markets. There are currently about 900 FIIs registered in India. Their heavy selling in the Indian market normally cause havoc and their continued investment and buying often takes the market to newer heights.

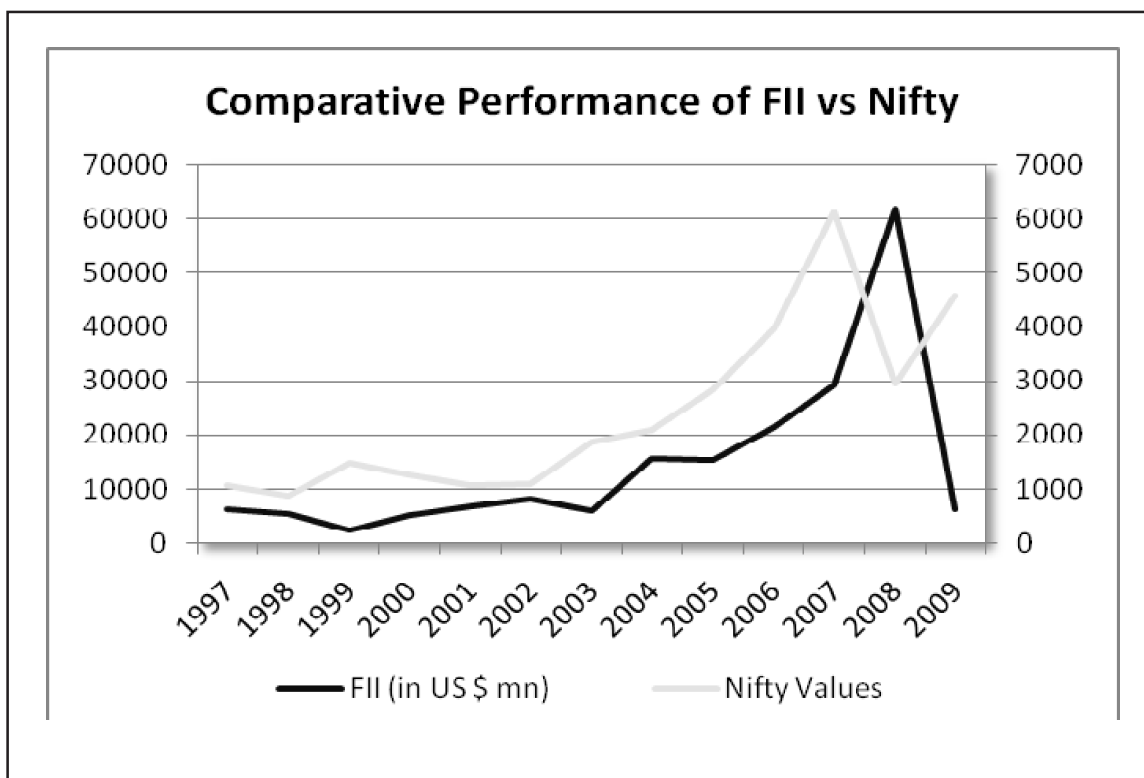


Figure – 5: Comparative Performance of FII vs Nifty
(Source: Statistics from Handbook on Statistics India, RBI)

The graph above shows the correlation between FII investments & Nifty Index performance. Contrary to expected results, the graph shows that FII is a **Lagging Indicator** of the stock market performance. Moreover it is **Pro-Cyclical** in nature. This implies that a rise in stock market index signals a rise in FII investments. One possible interpretation to this could be that FII invest in India only when they forecast Indian stock exchanges to perform positively. Therefore they await the stock markets to turn upward, before pumping money into the Indian economy and vice versa. However in a scenario where major investments are done by FII's this theory does not hold good. Another set of analysts believe that FII is a leading/co-incident indicator of the stock exchange. This view is supported by the real life experience of 2008 where the expected but abrupt end to the bull run in India's stock market, signaled by a 316-point intra day decline in Sensex on January 5, was brought about by portfolio adjustments by foreign institutional Investors. This volatility has been visible in the medium & long-term as well. From a low of 2924 on April 5, 2003, the Sensex had risen to 6194 on January 14, 2004, only to fall to 4505 on May 17, before rising to close at a peak of 6679 on January 3, 2005.

Indian stock markets are known to be narrow and shallow in the sense that there are few companies whose shares are actively traded. Thus, though there are more than 4,700 companies listed on the stock exchange, the NSE Index, Nifty, incorporates just 50

companies, trading in whose shares is seen as indicative of market activity. This shallowness would also mean that the effects of FII activity would be exaggerated by the influence their behavior has on other retail investors, who, in

herd-like fashion tend to follow the FIIs when making their investment decisions.

These features of Indian stock markets induce a high degree of volatility. In as much as an increase in investment by FIIs triggers a sharp price increase, it would in the first instance encourage further investments so that there is a tendency for any correction of price increases unwarranted by price earnings ratios to be delayed. And when the correction begins, it would have to be led by an FII pull-out and can take the form of an extremely sharp decline in prices.

LIMITATIONS

One possible limitation to the above indicator is the fact that FII values plotted in the graph above are for the economy as a whole & do not represent the money flowing into the stock market alone. Therefore there exists a possibility that while FII's stopped investing in stock markets; they could still be investing in individual companies. This results in an erratic pattern for comparison. Moreover, FII investments also have a positive influence on the volatility of the exchange rate, meaning that Foreign Investments inward remittances may increase the volatility of the exchange rate, however, presence of a foreign venture capital investor & indirect ties to foreign venture capitals through syndication networks of own domestic investors help mitigate the problems.

Unemployment Rates vis-à-vis Nifty

The unemployment rate represents the fraction of the labor force that is unemployed. It is published monthly in the government's employment report. It increases or falls following a change in economy activity

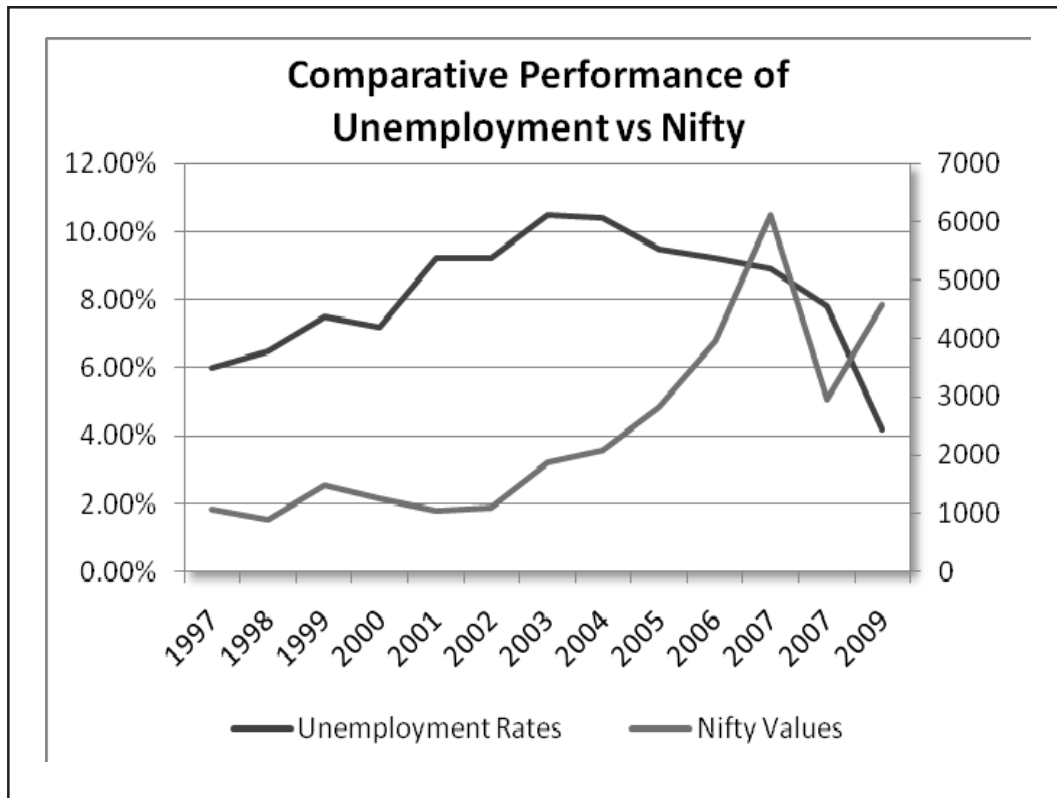


Figure – 6: Comparative Performance of Unemployment Rates vs. Nifty
(Source: Statistics from CIA World Fact book)

As seen in the graph above unemployment rates are a **Lagging Indicator** of the stock exchange markets. This can be understood by realizing the impact of the stock exchange on the economy as a whole. In recent times the scope of the Indian stock exchange has been gaining significant importance. The performance of the economy is highly dependent on the stock market performance, as an abrupt fall in stock markets cause a the economy to witness a slowdown. When the stock market falls, it negatively impact individual stock performance which translates to poor company performance. This in turn creates a spiral loop wherein the employees loose employment & the overall production of the economy falls. Therefore unemployment is a lagging indicator of the stock market performance. The analysis of the last five US recessions dating back to the early 1970s

reveals that three of the five recessions saw the unemployment rates continue to rise even after the recession was officially over. Moreover, during all five recessions the stock market (S&P 500) bottomed months before the worst unemployment reading was released. When the worst news hits the news wires, the S&P 500 was up on average 30% from the lows over the last five years. This indicates that unemployment is a lagging economic indicator. Further, the direction of the unemployment rate can be said to be **Counter-Cyclical**, as a rise in unemployment rates will lead to a fall in stock market index & vice versa.

Likely Impact on Financial Markets

- ❑ **Interest Rates:** Larger-than-expected monthly fall in the unemployment rate is considered inflationary causing interest rates

to rise. The bond market views an increase unemployment rate favorably especially when the economy is close to full capacity and the unemployment rate is close to its “natural rate”. A falling unemployment rate also makes it more likely that the RBI will increase the RBI Funds rate that is also bearish for the bond market.

- ❑ **Stock Prices:** Ambiguous. First, lower unemployment rate signals a strong economy, higher potential profits and that’s good for the stock market. Second, lower unemployment may increase expected inflation and lead to higher interest rates that are bad for the stock market. Third, lower unemployment rate may lead to higher wage inflation that is bearish for the stock market. The first effect dominates in recessions and early stages of economic recovery while the second and third dominate

when the economy is close to full capacity and the unemployment rate is low.

- ❑ **Exchange Rates:** Lower than expected unemployment rate will tend to appreciate the exchange rate as it is expected to lead to higher interest rates.

Crude Oil Price vis-à-vis Nifty

Crude Oil (commonly referred as Black Gold) is today the most valued resource after Precious metals. Countries having abundance of these resources are in a position to control the world economy. Crude Oil is also an important & most traded commodity on the stock markets. Prices of crude oil affect the performance of stock markets as it is an indicator of future economic growth.

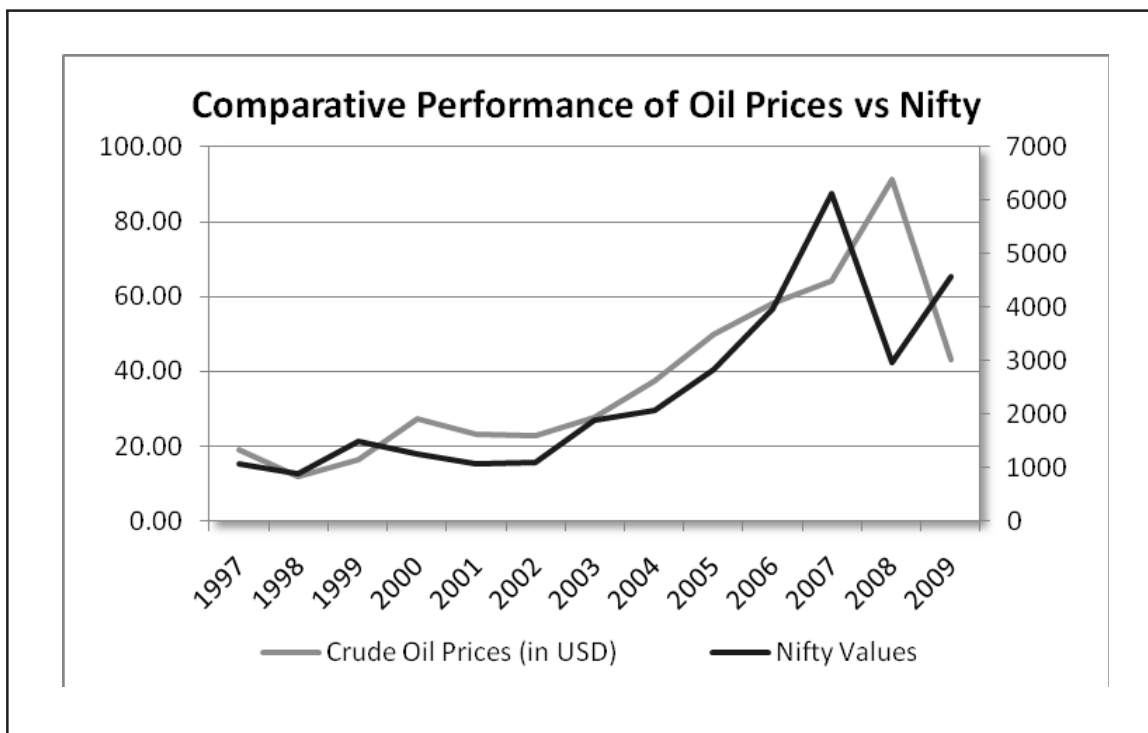


Figure – 7: Comparative Performance of Crude oil price vs Nifty
(Source: Statistics from Organization of the Petroleum Exporting Countries (OPEC))

The graph plotted above shows the relation between crude oil prices & stock markets. Although not very evident from the graph, it can be said that oil prices are ***Co-incident Indicators*** of the stock market index. Moreover the direction of these indicators is ***Counter-Cyclical***. This implies that rise in crude oil prices causes the stock market indexes to fall almost immediately.

Crude oil prices disrupt world stock markets indicating that they are a leading/co-incident indicator. Countries struggle to contain inflation which leads to slashing of interest rates. Rising inflation in turn decreases spending power of people leading to a significant slowdown in the economy. India was no exception to this understanding and when crude prices stayed above \$120 for a few weeks in 2008, the country's inflation crossed the 8% mark & stock markets tumbled to new lows. The only positive impact of high crude prices was only observed on off-shoring companies Aban Offshore & Great Offshore along with oil exploration companies like Reliance & Cairn Energy.

However it is not that easy to categorize crude oil prices as an indicator, because the response of aggregate stock returns may differ greatly depending on whether the increase in price of crude oil is driven by demand or supply shocks in the crude oil market. Conventional wisdom that higher oil prices necessarily cause lower returns is shown to apply only to oil-market specific demand shocks such as increase in the precautionary demand for crude oil that reflect fears about the availability of future oil supplies. In contrast, positive shocks to the global aggregate demand for industrial commodities are shown to cause both higher real oil prices & higher stock market prices.

Gold Price vis-à-vis Nifty

Among the various macro economic factors like inflation, crude oil, foreign institutional investment etc. Gold prices have emerged the most interesting topic in India. Gold has been widely used throughout the world as a vehicle for monetary exchange or in the form of hedge against inflation or in the form of jewellery. All these factors are the reason for hyping gold demand day by day.

As per world gold council (WGC), gold demand in India is about to rise 33% by 2020. The cumulative annual demand will be in excess of 1,200 tons by 2020 valued at about Rs 2, 50,000 crores at current level. India is the world's largest consumer of gold. Indian normally buys about 25 per cent of the world's gold, purchasing around 700-750 tons of gold every year. More than 18 years after New Delhi pawned 67 tons of gold to tide over a balance of payments crisis, the Reserve Bank of India has bought thrice that amount of gold from the International Monetary Fund to diversify its assets. The IMF had sold 200 metric tons of gold to the RBI, saying it represented almost half of the total sales volume of 403.3 metric tons that was approved by the Fund's Executive Board in September 2009.

Traditionally it was thought that stock market returns and gold price returns were negatively correlated which means when stock market fell gold prices increase this looked true during 1994-2002 analysis but after 2002 both stock market returns and gold price were moving up together which gave a reflection that these two may be positive correlated. If we compare the stock market returns and gold price returns we find an interesting pattern initially taking S&P CNX NIFTY returns and the gold price of the last nine years.

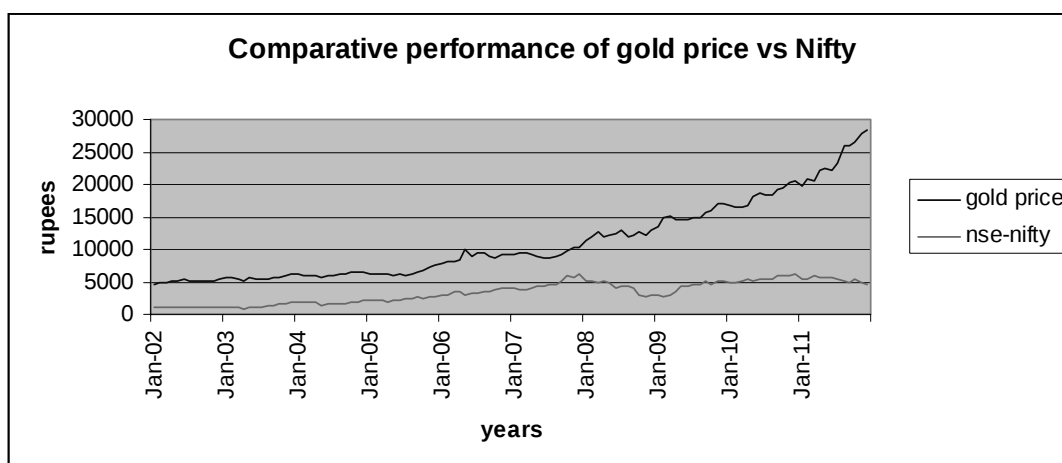


Figure – 8: Comparative Performance of Gold price vs Nifty
(Source: Handbook of statistic, SEBI)

Table 1: Granger Causality Test

Pair wise Granger Causality Tests			
Date: 03/13/12 Time: 08:46			
Sample: 2002M01 2011M12			
Lags: 5			
Null Hypothesis:	Obs	F-Statistic	Prob.
NSENIFTY does not Granger Cause GOLDPRICE	115	0.46509	0.8014
GOLDPRICE does not Granger Cause NSENIFTY		0.44396	0.8168

In the **Table 1** the null hypothesis is H_0 : Gold price does not effect Nifty index returns & vice versa. The alternative hypothesis is H_1 : Gold price effect Nifty index return & vice versa. Since the P value in Table 3 is more then 5% in both the cases. We will accept the null hypothesis that Gold price does not cause and effect the Nifty index return or Nifty index does not cause and effect gold price Gold price has been increasing steadily form 2000 onward while the stock market were down from 2000 to 2003. If we analysis the figure 1.2 from 2002 to 2007 stock market and gold price were going

in tandems and seems to be positively correlated against the historical view that they were negatively correlated but this positive correlation view got a setback in the year 2008 when due to US sub prime crisis market crashed and gold emerged as perfect hedge against economic crisis. There is gap growing from 2008 to 2010 between the gold price and nifty index. Equity and gold were moving in opposite directions, displaying the ability of the yellow metal to protect one's portfolio at the time of dip.

CONCLUSION

After understanding the above mentioned indicators & identifying their relationship with stock market indexes, we can forecast/predict

the future course of stock market indexes with some certainty. A summary of the above mentioned macroeconomic indicators is as under.

Macroeconomic indicators	Timing	Direction
Gross Domestic product (GDP)	Leading	Pro Cyclical
Inflation	Co-incident	Counter Cyclical
Exchange Rate	Co-incident	Counter Cyclical
Index of industrial production (IIP)	Co-incident	Pro Cyclical
Foreign institutional Investor (FII)	Lagging	Pro Cyclical
Unemployment Rate	Lagging	Counter Cyclical

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