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A Survey on Empirical Literature Relating To Oil Economics

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ABSTRACT: The objective of this paper is to bring out the empirical studies relating to the crude oil price hike impacting the growth rate, exchange rate, inflation, capital market, gold prices and macroeconomic uncertainty of different countries. Forty empirical studies published during 2000-14 have been selected for review that analysed the impact of crude oil price hike on importing and exporting countries and their growth and de-growth. These studies applied ADF (Augmented Dickey Fuller test Granger Causality test and Johansen Co-integration test and GARCH (Generalized Autoregressive conditional Hetroskedasticity), VECM (vector error correction model), to find the best of the results. Energy consumption does not affect the economic growth of low income countries where as it affects the growth of high growth emerging economies. Oil export earnings of oil producing countries are exhausted for paying non-oil import bills. This makes oil export earnings not available for domestic economic development needs. The impact of international oil price is transmitted to the countries through exchange rate of respective currencies against US Dollar. As the international influence in determining domestic inflation is stronger the monetary policy becomes ineffective in controlling inflation. The volatilities in US oil derivative markets make macroeconomic uncertainties in all the countries in the world. This affects financial and gold markets of these countries.

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I. INTRODUCTION

Among different forms of energy, Crude oil occupies a crucial and strategic place in the energy economy of a country. Payment for oil eats up a substantial portion of foreign exchange of oil consuming countries. The import bill of these countries touched a peak level of $2 trillion. India's oil import bill is around 30% of her total imports. Economic theory advocates that monopoly control over a commodity which has less elastic demand will always push the prices upwards. Cartelization in 1960's and 1970's and speculation that began in early 1980's are the probable events that might have been causing the dynamic changes in international oil market. Functioning of the economy of any country depends inevitably on availability of various forms of energy at affordable cost. The invention of hybrid derivative products with oil as underlying asset in the international capital market joins with the less elastic consumption demand for oil in determining its price. The consumption demand in the real market and speculative demand in the capital market keeps the oil price moving up in the long run. Studying the consequences of volatile and spiraling trend in oil prices remains unexplored. This survey of research work attempts to find theoretical and empirical literature relating to oil economics in full description. As many as 40 empirical research works conducted during 2000 to 2014 have been reviewed. The second section of this paper comprises of review works on crude oil price and real sector variables such as growth rate, exchange rate, inflation and macroeconomic uncertainty. The third section is devoted to review works on crude oil price and financial sector variables. The fourth section offers concluding comments.

II. CRUDE OIL AND REAL SECTOR VARIABLES:

Real sector refers to the sector in which there are productions of goods and services through combined utilization of raw materials and other production factors such as labour force, land and capital or by means of production process. Market is the determining force of what society should produce and through what combination of production factors.

There are two major markets in this sector: 1) Factor market, which includes markets for raw material, labour, land and capital. 2) Product market, which is the market for finished goods. The real sector utilizes production factors with the business operators managing the process in order to produce goods and services. This paper first considers the relationship between crude oil price and growth rate as crude oil prices are likely

to affect the economic growth of a country. Various studies conducted to assess the relationship between crude oil price volatility and its impact on growth rate of different countries is reviewed. Secondly the relationship between crude oil and exchange rate of different countries' currencies against US dollar is taken up. Thirdly the relationship between crude oil price and inflation, that is, how does the hike in crude prices translate in to domestic inflation in various countries? Fourthly how does the crude oil price fluctuation (oil shocks) bring uncertainty at macro level ?

2.1 Crude oil and Growth rate: Growth rate of a country shows the overall health of an economy. It indicates incremental change in economic activities of a country. To achieve the highest level of growth energy is a prerequisite .Non-renewable energy (crude oil) is a major source of energy which is used for transportation of essential to manufacturing and service sectors. Rise in the price of crude oil has a negative impact on the growth rate.

Energy consumption affects economic growth of countries. Production and distribution of commodities in real sector consume energy. Eyup Dogan (2014) investigated the causal relationship between energy consumption and economic growth by studying four low income sub Saharan African countries. Annual data on energy consumption and real GDP per capita for the years between 1971 and 2011 is used by applying Dickey Fuller's ADF unit root test to know whether or not the variables energy consumption and economic growth are stationary series. Co-integration test was applied to find if one or more linear combinations of values of the time series variables are stationary even though they are individually non-stationary. Johansen co-integration model also applied along with Granger causality test which is a statistical hypothesis test to determine whether or not one time series is useful in forecasting another. The result of the ADF unit root test shows that the time series are not stationary after taking the differences of the data and log of energy consumption become stationary for all countries. The finding of the Johansen Co-integration test demonstrates that variables are not Co-integrated in the case of some countries, so no long run relationship between the variables exists in any countries. The Granger causality test indicates that there is a unidirectional causality running from energy use to economic growth in some countries and no causality linkage exist in some other countries. The study reveals that there is no strong evidence for long run and casual relationship between energy consumption and economic growth in the case of low income countries.

The low income fast growing emerging economies differ from that of other low income developing countries in terms of oil consumption effect. Hasen Naser (2014) examined the relationship between oil consumption, nuclear energy consumption, oil price and economic growth in four emerging economies (Russia, China, South Korea and India) over the period from 1965 to 2010. The variables employed include nuclear energy consumption per capita (NC), oil consumption per capita (OC), real gross domestic per capita (RGDP) and real oil price (ROP). Both oil and nuclear energy consumption are obtained from BP Statistical Review of World Energy (2011). Real GDP Per capita measured in constant 2005 US dollars is sourced from the World Development Indicator (WDI 2011). Real oil price is defined as the US dollar price of oil, where oil price is converted to the domestic currency and then deflated by the domestic consumer price index (CPI) which is derived from International Financial Statistics (IFS) published by IMF. The study employed Vector Auto regression (VAR) analysis and a modified version of Granger Causality test developed by Toda and Yamamoto, It is found that the level of world crude oil prices (WTI) plays a crucial role in determining the economic growth in the investigated countries. The results suggest there is a unidirectional casualty running from real GDP to oil consumption in China and South Korea, while bidirectional relationship between oil consumption and real GDP growth appears in India. Furthermore, the results reveal that while nuclear energy stimulates economic growth in both South Korea and India, the rapid increase in China's economic growth requires additional usage of Nuclear energy.

Economic growth of a country depends on the level of energy percapita and energy consumption. Mustafa Saatci and Yasemin Dumrul (2013) studied the relationship between energy consumption and economic growth: Evidence from a structural break analysis for Turkey. The aim of the study was to re-examine the casual relationship between energy consumption and economic growth. The authors concluded that Turkey's Energy consumption and Economic growth showed a positive relationship of varying quantity with structural breaks. Policies offered by authors such as reducing dependency on external energy resources and decreasing the dependency of economic growth on energy consumption. For the same, energy saving measures need to be implemented in industrial and housing sectors

International Oil prices affect the economic growth of oil consuming small countries. Amaira Bouzid (2012) analyzed how change in real crude oil price affects the real GDP of Tunisia negatively using Vector Error Correction Model (VECM). Both series are integrated of order one. There exist a long-term relationship between energy prices and economic growth. Granger pair wise causality test revealed unidirectional causality from real GDP to oil prices. The empirical findings expose the fact that international oil price is a key variable that influence economic growth in Tunisia within the sample model. To examine the sensitivity of real GDP in

Tunisia to shock in international oil prices Johansen co-integration test was used with long run vector coefficients.

International oil price tends to affect the economic growth of oil exporting countries also. Latife Ghalayini (2011) found the interaction between oil price and economic growth. The author investigated if economic growth is explained by changes in oil price and if there are any differences in oil price effects on economic growth among countries. The results of unit root test and Granger causality tests conclude that the relationship between oil price and world economic growth is not clear. For Oil exporting countries it is found that the increase in oil price did not cause the increase in economic growth. In fact the inflow of funds in to oil exporting countries after an increase in oil price found their way out side these countries and do not help to achieve economic development goals.

The effect of oil price on economic growth depends on its impact on export earnings, human capital and physical capital of a country. Noor-e-saher (2011) assessed the impact of oil prices on economic growth and export earnings of Pakistan and India. The empirical findings indicate that long run relationship exist among the variables in both countries. The oil price has impeded the export earnings, human capital, physical capital and economic growth. Physical capital and oil prices are economic growth enhancing factors in the case of Pakistan. In case of India human capital, physical capital and oil prices are positively related to export earnings, where as economic growth is negatively related to export earnings. The result of the economic growth model indicates that only human capital and physical capital are positively related to economic growth.

Oil price changes create its effect through its link with international reserves of a country. Thiru K. Jayaraman and EvanLau (2011) proved this through a five country panel data analysis. They studied oil price and economic growth in small pacific island countries (PIC). The study developed a panel analysis procedure for five major PIC's namely Fiji, Samoa, Solomon islands, Tonga and Vanucate with a view to assess the impact of oil prices on economic growth. The study attempts to use a multivariate model with a view to avoid any likely omitted variables bias. In the short run the causality linkage ran from oil price and international reserves to output. In the short run surge in oil price are beyond the control of small island nations and hence the scope for short term measures is minimal. To minimize the impact the governments can reduce import duties and VAT. The long-term policy measures that adjust for high oil prices like ensuring efficient use of energy is likely to work

Oil price in international market don't spare small developed countries. Rukmini Gounder and Matthew Bartleet (2007) examined the impact of changes in world price of oil on Newzealand's growth. The issue of oil price shock impacts on economic growth is studied using the vector auto regressive methodology based on quarterly data. The short run impact of oil price shocks on economic growth has been considered in a multivariate frame work. This allows analyzing the direct economic impact as well as indirect linkages. The models employ the linear oil price and two leading non-linear oil price transformation to examine various short run impacts. Utilizing the Wald and Likelihood ratio tests of Granger Causality, they found that linear price change, asymmetric price increase and the net oil price variables are significant for the system as a whole, where as the asymmetric price decrease is not. Following the causality analysis of oil price the growth nexus and generalized impulse response and error variance decomposition reaffirm the direct link between the net oil price shock and growth, as well as indirect linkages via inflation and real exchange rate which have key influence on the domestic economy.

Energy price creates effects on economic growth through various channels. Lucas Bret Schger and ETH Zurich (2007) analyzed the different channels through which energy price affect economic growth. The conditions for crowding out of capital by intensive energy use are derived. In the empirical analysis, estimation using a system with five simultaneous equations for a sample of 37 developed countries with the five years average panel data over the period of 1975-2004. It showed that raising energy prices are not a great threat to long run economic development. On the contrary they found decreasing energy input induces investment in physical, human and knowledge capital which fosters the growth rate. The author concludes that crowding out of capital by abundant and cheap energy supply is shown to be closely linked to difference in energy intensities between consumer and capital goods production on the one hand and elasticity of substitution with in the capital sector on the other.

Oil price is such powerful that it can affect industrially advanced countries also. Rebecca Jimenez-Rodriguez and Marcelozanchez (2004) assessed empirically the effects of oil price shocks on the real economic development of the main industrialized (OECD) countries. The study found evidence for a non-linear impact of oil prices on real GDP. In particular, oil price increases are found to have impact on GDP growth of a larger magnitude than that of oil price declines. Among oil importing countries, oil price increase are found to have a negative impact on economic activity in all cases but not Japan. Moreover, the effect of the oil price shocks on GDP growth differs between the two oil exporting countries in the sample, with oil price increase affecting the UK negatively and Norway positively.

Energy prices affect the big developing countries with large population. John Asafu Adjaye (2000) estimated the causal relationship between energy- income relationship for India, Indonesia, the Philippines and Thailand using co-integration and error correction modeling techniques. Annual time series data utilized in the study, data for India and Indonesia covers period 1973-1995, for Thailand and the Philippines the study period was 1971-1995. Data were obtained from World Development Indicators (WDI-1998, published by World Bank).The study found bidirectional granger casualty between energy consumption and income. This has a number of Policy implications. A high level of economic growth leads to high level of energy demand and vice versa. Energy consumption policies that aim at curtailing energy use must rather find ways of reducing consumer demand. Such a policy could be achieved through an appropriate mix of energy taxes and subsidies. The results found a bidirectional casualty in two out of four countries call for cautions in the use of single equation regressions of income on energy for conducting econometric forecast. The results found energy consumption, income and prices of oil are endogenous and therefore single equation forecast of one or the other could be misleading. Energy dependent economies are relatively more vulnerable to energy shocks. Indonesia is the only net energy exporter in the sample and therefore it is found to be in short run neutrality between energy and income.

The analyses and discussions of the studies on relationship between oil prices and economic growth lead to the following conclusions: a) There is no strong evidence for long run and casual relationship between energy consumption and economic growth in the case of low income countries b) There is casual relationship between energy consumption and economic growth in the case of emerging economies and nuclear energy complements oil energy in fulfilling energy requirements of growth process c) Oil Consumption played a positive role in economic growth of Turkey d) Economic growth of small countries is sensitive to crude oil prices in international market e) Export earnings of oil exporting countries move out of the countries making the funds not available for financing the development expenditures f) The oil price has impeded the export earnings, human capital, physical capital and economic growth g) Oil prices adversely affect the international reserves of small countries h) International oil price has both direct and indirect influence on the domestic economy of developed countries also i) Raising energy prices are not a great threat to long run economic development while falling oil prices induces investment j) Oil importing developed countries are adversely affected by rise in oil price k) The development efforts of big developing countries with large population generate high demand for energy and energy price in turn affects the development efforts.

2.2. Crude oil and Exchange rate:

Exchange rate of a country reflects the purchasing power and balance of payments position of a country. Whenever there is a hike in crude oil price it widens the current account deficit and deteriorates the foreign exchange reserves of a country. Filip Novotny says a weakening of the dollar of 1% causes the Brent oil price to rise by 2.1%. The contrary movements in the Brent oil price and the dollar exchange rate are factors dampening the impact of sharp fluctuations in the dollar price of oil on "non-dollar" economies.

Speculative transactions in crude oil derivative market exert short run influence on similar transactions in foreign exchange derivatives markets also. Ching-Chun Wei and Chung-Husan Chen (2014) examined whether the volatility of the WTI oil spot returns (WTIR) is affected by the Texas light sweet oil future returns (FUR), the exchange rate returns between the US dollar and the Euro (ERR) and the S&P 500 energy index returns (EIR) and if any of those have changed over time. The daily data of WTIR, the FUR, the ERR and the EIR between the period of Jan 4, 2000 and Sep 30, 2009 were utilized. The empirical results of multivariate GARCH of the BEKK model indicated that the WTIR is significantly affected by its own past volatility and by the volatility of FUR, ERR and EIR. Most likely, WITR employs a structured conversion in our dummy variable for selected time points. This suggests that investors could use the FUR's past volatility as a basis for WITR purchases. In addition the changes in ERR's and EIR's past volatility can be partially used as a basis for the same purpose. Thus, Texas light sweet oil future transactions influence other oil derivative markets and exchange rate derivative markets.

Oil price shocks influences the exchange rate of counties depending on imports of crude oil to meet their majority of energy needs. Joscha Beckmann and Robert Czudaj (2012) analysed oil price and US dollar exchange rate dynamics. Oil price has been affected by several shocks due to the exogenous historical events as found Markov-Switiching Vector Error Correction Model (VECM). The study used monthly data set including the oil pries and the index of consumer prices of the USA as the foreign country as well as the CPI's of ten different states regarded as domestic countries. The results confirm changes in nominal oil prices trigger real exchange rate effects through the nominal exchange rate and the price differential. A reversed causality was observed as shock in nominal exchange rate also influence nominal oil prices in some cases. The pattern of nominal appreciation against the dollar was mostly observed for oil exporting countries while the nominal depreciation was detected for importing countries.

Oil price shocks penetrate through exchange rate of a country in to the domestic inflation. Mohd.shaidan shaari et.al (2012) examined the effects of oil price shock through exchange rate on inflation in Malaysia using monthly data from 2005 to 2011.The empirical findings show, the co-integration between all variables exist also at 5% significance level in the long run. But in the short run only oil price affected the inflation. For Granger causality test, it is found that inflation does not granger cause the exchange rate but it does granger cause to the oil price. The oil price does granger cause to the inflation but it does not granger cause to the exchange rate. The exchange rate does not granger cause to both of the variables (inflation and oil prices). So, when crude price changes the inflation also changes. This finding offered Malaysian government in making policy to control the petrol price to avoid from the inflation.

Exchange rate of emerging economies is more vulnerable to oil shocks than other economies. Ibrahim Tuhran and et.al (2012) analysed the dynamic relationship between oil prices and exchange rate of selected emerging economies. The results show that an increased importance is being given to oil price movements after the financial crisis, as oil prices rise there is an apparent depreciation of the local currency against the US dollar and the co-movements has increased during the study period. There are number of reasons why this co-movement is getting stronger. One reason is that emerging economies have recovered far more quickly than developed countries from the crisis. Increasing oil prices create a positive sentiment to emerging economies as they are expected to grow faster than the developed economies.

Certainly the oil price hike has an impact on any of the crude oil importing country as the mode of payment is in US dollars. Ademola Ojebiyi and David Olugbenga Wilson (2011) studied the relationship between the Nigerian Naira, oil prices and US dollar using monthly data from 1999-2009. The study adopted the ordinary least square using regression analysis and also the correlation model which shows that there is a weak/negative relationship between exchange rate and oil price as there are other factors that brings about changes in oil price other than the exchange rate. The activities of cartel and oil speculators too have come to greatly affect the price of crude oil. The results infer that there are other factors that affect the change in oil price apart from the exchange rate. Crude oil price change is usually very sensitive to events around the world and tensions in the oil producing nations. OPEC too affects the price of crude oil by increasing or decreasing the allocations to be sold by the countries. The activities of oil speculators too have come to greatly affect the price of crude oil.

There is a distinction between net oil exporting and net oil importing counties in terms of exchange rate responses to the change in the price of oil. Mukhriz Izraf azman Aziz (2009) compared net oil exporting and net oil importing countries. The paper has found evidence of non-stationarity for the three series for all groups of countries. For real oil price and real exchange rate, the series contain unit root as all panel unit root tests fail to reject the null hypothesis of unit root at 1% level of significance. For real interest rate differential, it appears to be weekly non-stationary especially for oil exporting countries and panel of eight countries as the null hypothesis of unit root can only be rejected at10% significance level by most unit root tests. The paper has shown evidence of long-term relation between the three series, and of causality running from real oil price to the real exchange rate.

Exchange rate of small open industrial economies is prone to international oil prices. Iihan Ozturk and et.al (2008) investigated the link between international oil prices and the exchange rate in the case of small open industrial economy without oil resources namely Turkey. The study applied the Johansen co-integration and Granger Causality tests in the case of Turkey which is a small open industrial economy without oil resources. Crude oil prices have Granger caused the USD/YTL exchange rate over the period of 1982-2006.

There exist a long run relationship between real oil prices and real exchange rates. Leili Nikbakht (2008) investigated the long run relationship between real oil prices and real exchange rates by using monthly panel of seven countries of OPEC members from 2000:01 to 2007:12. The study concludes there is a long run and positive linkage between real oil prices and real exchange rates. Since the real exchange rate of OPEC members depends on oil price movements severely, the author suggests that the relationship is powerful and oil shocks are to be considered in their economic planning and decision making.

Small open economies are hit by an exogenous oil price shock. Michael Plante (2008) examined exchange rate management issues when a small open economy is hit by an exogenous oil price shock. The author built a model in which consumer durables play a vital role in the demand for oil and oil based products as opposed to the traditional role of oil as a factor of production. When prices are sticky oil price shocks lead to reduced output, lower inflation, and exchange rate depreciations. Output losses occur whether or not oil is in the production function because of volatile spending on durables. The author concludes that flexible exchange rates produce smaller output losses and less volatile inflation in the non-tradable sector than fixed exchange rates but at the cost of front-loading real exchange rate movements.

The analyses and discussions of the studies on relationship between oil prices and exchange rate lead to the following conclusions: a) WTI oil spot returns is affected by its own past volatility and by volatility of Future returns (FUR), Exchange rate returns (ERR) and Energy Index returns (EIR) b) Changes in the nominal

oil prices trigger real exchange rate effects through the nominal exchange rate for exporting countries and the price differential and vice versa for importing countries. c) As the crude oil price changes the level of inflation too changes through exchange rate in case of Malaysian economy d) Emerging economies recover very quickly than the developed countries from economic crisis and oil price shocks too e) There is a negative/weak relationship between exchange rate and oil prices as there are other factors like cartel pricing policy and investment activities of oil speculators f) Turkey's exchange rate fluctuated due to the change in crude price over the study period. Exchange rate of small industrialized open economies fluctuates due to change in crude oil prices. g) Positive long run relationship exists in real oil prices and real exchange rates of OPEC member countries h) Flexible exchange rate produces smaller output losses in the non tradable sector than fixed exchange rate.

2.3. Crude oil and Inflation:

The crude oil price and inflation are interconnected as a cause and an effect. There is a direct relationship between crude price and inflation. Since petrol and diesel are used as a fuel in transportation, manufacturing and service sector, ups and downs in the price of petrol and diesel have a cascading effect on the overall performance of an economy.

Food sector prices are influenced by high speed diesel prices as diesel is fuel for trucks to carry the agricultural output from one part of the country to other. Syed Atif Ali et.al (2012) examined the effects of high speed diesel oil prices on food sector prices in Pakistan using multiple linear regression. The food items include rice, maize, wheat, chicken and cooking oil which are dependent variables in the study. The independent variable is high speed diesel price. The study found a significant relationship and positive effect of oil prices on food inflation. The study concludes that there is a highly significant effect of oil prices on food inflation.

Oil price shocks have a sudden transmission in to the economies through inflation. Benjamin Wong (2012) found the impact of different oil shocks on US inflation and inflation expectations since 1970's. The findings confirm oil supply shocks have never been a major factor, demand side shocks in the oil market generally been more important in explaining inflation dynamics and inflation expectations. The authors said that exogenous political events induce oil shocks that are more inflationary. The author concludes that demand shocks in the oil market have a much larger role for inflation and inflation expectations. The response to oil supply shocks that raise real oil prices by the same magnitude doesn't appear to exhibit time variation invoking a hypothetical thought experiment where demand side shocks in the oil market raise the real oil price by a fixed magnitude (say 10%) shows a large drop off in the response of inflation and inflation expectations.

Consumer price Index (CPI) is a best indicator of inflation than Whole sale price index (WPI). Surjit Bhalla (2011) studied that across most countries emerging and developed, the best indicator of overall inflation (as measured by GDP deflator) is the consumer price index (CPI). Policy makers in India, including the RBI have been erroneously using the whole sale price index (WPI) as a surrogate for underlying inflation even when its ability to accurately forecast overall inflation is close to zero, especially in the presence of information on CPI inflation. Since February 20th 2011, a new national CPI index has been released with urban and rural all India components. Indian inflation for the last thirty years is strongly correlated to international inflation which in turn is correlated to commodity prices over which domestic monetary policy has little control, each $10 rise in oil price increases inflation by about 0.5% for emerging markets, including India. For developed economies, the effects are muted- each $10 rise in the price of oil raises the inflation rate by only 0.03 percent.

The analyses and discussions of the studies on relationship between oil prices and inflation lead to the following conclusions: a) High speed diesel price found to be have highly significant effect on food inflation in Pakistan b) Exogenous political factors induce oil shocks that are more inflationary and demand shocks in the oil market have a much larger role for inflation and inflation expectations than supply shocks c) Crude oil price rise highly correlates with CPI index and confirms domestic monetary policy has a little control.

2.4. Oil Price Shocks and Macro Economic Uncertainty:

Oil price volatility infuses uncertainty in macro economic variables of a country like current account deficit, exchange rate, growth rate etc and affects the overall economic activity. Volatility in the oil prices having a cascading effect on overall economy transmits it in to domestic inflation and widens the current account deficit and deteriorates the forex reserves of the country.

Oil shock impact differs in times of increased uncertainty to normal uncertainty. Ine Van Robays (2012) evaluated whether the impact of oil shocks differs in times of increased uncertainty. The author concluded in his study that higher uncertainty tends to significantly increase the oil price impact for a given change in oil production, implying a lower price elasticity of oil demand and supply in the uncertain regime. The difference in the oil demand elasticity is economically meaningful as the price impact of oil supply shocks might easily double in volatile macroeconomic times, heightened uncertainty about the macro economic outlook

can explain time variations in the elasticity of oil and hence in oil price volatility. The impact of oil shocks on economic activity appears to be significantly reinforced by uncertainty.

To shield the domestic petrol consumer the government adopts pass through policy on hike in international crude prices. N.R.Bhanumurthy et.al (2012) analysed the impact of transmission of international oil prices and domestic oil prices to pass through policy on major macro economic variables in India with the help of macroeconomic policy simulation model in three major channel like import channel, price channel and fiscal channel. The policy option of deregulation of domestic oil prices in the scenario of occurrence of a onetime shock in international oil prices as well as No oil price shock stimulation analysed through its impact on growth, inflation, fiscal balances and external balances during the 12^{th} plan period of 2012-13 to 2016-17.The simulation results indicate that in the short run the deregulation policy would have adverse impact on the growth as well as on the inflation. But if this policy is complemented with the policy of switching of subsidy bill to capital expenditure it might result in positive growth effect in the medium and long run. Given the current pass through policy, one time oil shocks have adverse impact on growth and inflation in the year of shock while it mitigates slowly overtime. The multi linear regression model shows that with the oil shock and with current partial pass though regime a 10 % rise in oil prices result in a 0.6% fall in growth while in the pass through policy situation, it can reduce the growth by 0.9%.

Oil price shocks imposes burden on the fiscal positions of the world economies .Nathen S.Balke et.al (2011) explored oil price shocks and US economic volatility from 1970 to 2009. In this paper Bayesian methods employed with a dynamic stochastic general equilibrium model of world economic activity to identify the sources of world oil price shocks and to assess the effects of those shocks on US economic activity. It is found that oil prices are endogenous because oil supply shocks, domestic shocks and foreign non oil shocks all differ in their effects on oil prices and US economic activity. In addition it is found that oil price movements in 1970's and early 1980's reflect different mix of demand and supply shocks than those in the 2000's. Oil price in the 2000's is being driven primarily by foreign demand shocks.

Oil price shocks exert pressure on the oil importing countries and its macroeconomic variables. Sajal Ghosh and Kakali Kanjilal (2009) explored the effects of linear and non-linear oil price shocks on macro economic variables for India, a major oil importing developing country, for the period of March 1991 to January 2009. The period considered for the study comes under the highly subsidized regulated regime of petroleum product prices in India. The study concludes that movement in oil price is exogenous with respect to India's macroeconomic movements and the impact of oil price shocks is asymmetric in nature with negative price shocks having more pronounced effect on macro economic variables than positive shocks.

Macro economic variables in emerging economies are affected due to oil price volatility than other developed economies. Ruhul Salim and S.Rafiq (2004) investigated the impact of oil price volatility on six major emerging economies of Asia namely, China, India, Indonesia, Malaysia, the Philippines and Thailand. The study used quarterly data on three different variables namely oil price volatility, GDP growth and inflation. The study period is 1986-2009 and it is split in the case of few countries according to data availability for studying oil price volatility. Both parametric and non-parametric tests such as historic volatility (HS), Stochastic volatility (SV), Implied volatility (IM), realized volatility(RV) and additional volatility were suggested in literature. The study applied the granger causality test to examine casual relationship between oil price volatility, output growth and inflation of six major economies of Asia. To study time series properties of the data the study performs three different unit root tests (ADF), Phillip Peron (PP) test and Kwiktkowski-Phillip-Schmdit-Shin (KPSS) unit root test. The results found Indonesia, Malaysia and Thailand are the most affected countries by the financial crisis. Two different VAR systems are employed to investigate and compare the impact of oil price volatility on economic activities for whole period and for the period after crisis. China, India and Philippines are the least affected countries. VAR analysis along with Granger Casualty test confirms oil price volatility impacts output growth in the short run for China. For India oil price volatility impact both GDP growth and inflation, for Philippines oil price volatility impact inflation. It is found that for these countries oil price volatility seems slightly endogenous. This may be due to exchange rates in constructing the realized volatility. For Malaysia oil price volatility impacts GDP growth, for Thailand it affects output growth for whole period. The study suggests that for mitigating the crisis oil subsidization and maintenance of oil fund will reduce the adverse effects of oil price volatility.

The analyses and discussions of the studies on relationship between oil prices and macroeconomic uncertainty lead to the following conclusions: a) Oil demand elasticity doubles at heightened uncertainty in oil supply shocks than the normal uncertain movements b) Short run deregulation policy is found to have adverse impact on the growth as well as on inflation, expecting the burden of subsidy the successive governments in India deregulated the price of Petrol and diesel c) Oil price found to be endogenous as oil supply shocks, domestic shocks and foreign non-oil shocks (Geo-political events) differently affected the US economic activity d) Oil price found tobe exogenous with respect to India's macroeconomic trend and the impact of oil price shocks is asymmetric in nature with negative price shocks having more pronounced effect on macro economic

variables than positive shocks e) Financial crisis impacted the South East Asian Nations, output growth affected in China in the short run due to oil price volatility, for India oil price volatility affected GDP growth and inflation and for Philippines its impact is on inflation. For emerging economies oil price volatility is found tobe endogenous.

III. CRUDE OIL PRICE AND FINANCIAL SECTOR VARIABLES:

Financial sector consists of institutions, instruments and markets for money and capital. It also includes the legal and the regulatory framework that permit transactions to be made through the extension of credit. Fundamentally, financial sector development concerns overcoming "costs" incurred in the financial system. This process of reducing costs of acquiring information, enforcing contracts, and executing transactions results in the emergence of financial contracts, intermediaries, and markets. Different types and combinations of information, transaction, and enforcement costs in conjunction with different regulatory, legal and tax systems have motivated distinct forms of contracts, intermediaries and markets across countries in different times. The five key functions of a financial system in a country are: (i) information production ex ante about possible investments and capital allocation; (ii) monitoring investments and the exercise of corporate governance after providing financing; (iii) facilitation of the trading, diversification, and management of risk; (iv) mobilizations and pooling of savings; and (v) promoting the exchange of goods and services. Financial sector development takes place when financial instruments, markets, and intermediaries work together to reduce the costs of information, enforcement and transactions. A solid and well-functioning financial sector is a powerful engine behind economic growth. It generates local savings, which in turn lead to productive investments in local business. Furthermore, effective banking can channel international streams of private remittances. The financial sector therefore provides the rudiments for income-growth and job creation.

Richard J. Herring and Anthony distinguished financial institutions from real sector firms by pointing out the relatively small share of real assets on their balance sheets of finance firms. Thus, the direct impact of financial institutions on the real economy is relatively minor. The indirect impact of financial markets and institutions on economic performance is extraordinarily important. The financial sector mobilizes savings and allocates credit across space and time. It provides not only payment services, but also enables firms and households to cope with economic uncertainties by hedging, pooling, sharing and pricing risks. An efficient financial sector reduces the cost and risk of producing and trading goods and services and thus makes an important contribution to raising the standard of living.

Since crude oil derivatives are traded in financial market and it is very crucial for deciding the prices of crude oil apart from the demand and supply factors for crude oil. Mainly the speculative traders play a crucial role in determining the price of crude oil in that case financial sector is said to be most crucial.

Oil Price impacts the stock prices and exchange rate. Manish Kumar (2014) examined the impact of oil prices on the stock market and exchange rates using the daily data for India. For India, a rise in global oil price may have direct effect on the inflation rate and trade balance, leading to higher current account deficit and a deteriorating net foreign asset position. At the same time higher oil prices may induce a demand for wage hike to offset the higher cost of living. This may also lead to decline in private disposable income and corporate profitability, and thus reduce domestic demand and stock prices while also pulling down the exchange rate. The author stated that consumption of petroleum products in the year 2000 was 2,127.4 Thousand barrels per day (TBD), which rose to 3,116.2 TBD in 2010. The corresponding domestic production figures were 770.1 and 953.9 TBD. This increased dependence on import led to a rise of the import bill from US $ 79.55 billion in 2009-10 to US $ 106 billion in 2010-11, the two figures being about 3% and 2.8% of the GDP for the years 2009-10 respectively. As International Energy Agency (IEA) estimates suggest a US $ 25 to US $ 35 rise in the oil prices causes a two year drop in GDP of 0.3 percent for US, 0.4 percent for Japan and 0.5 percent for Euro zone. This sensivity for the Indian economy may not be negligible. The study employed Baba, Engle, Kraft and Kroner – Generalized Autoregressive Conditional Hetroskedasticity (BEKK-GARCH) model to capture the volatility transmission and compute the optimal weights and hedging ratios for the portfolios consisting of stock market and oil, and stock market and exchange rates. The study also used ADF, Phillip Peron (PP) and Zivot-Andrews tests to examine the stationarity of the time series of the daily returns on NIFTY, INR/USD & WTI. The key finding of the study are: the results of the ADF and Zivot-Andrews test showed that the three series (NIFTY, WTI & INR/USD) at stationary at their log-first difference, Johansen co integration test suggests that evidence of co integration could not be established among NIFTY, WTI and INR/USD. The results of the long run elasticity test show that both WTI & INR/USD exchange rates have a positive effect on NIFTY, which is significant at the one percent level. The results on return spill over suggest that the WTI affects both NIFTY and INR/USD. The results of the volatility spill over suggest that WTI affects only NIFTY and NIFTY affects INR/USD. WTI is Unaffected by the innovations of the NIFTY & INR/USD. The results confirm the presence of return and volatility spill over, and in particular the WTI dominates spill over to other Indian financial time series.

Gold price is influenced by oil price shocks and the financial variables too. Dr.Amalendes Bhunia (2013) investigated the Co-integration relationship among crude price, domestic gold price and selected financial variables (exchange rate and stock prices) in India. Hike in crude price increase the production cost which will affect cash flow and will decrease stock prices. Investors showing fewer concerns in the stock market and investing in the yellow metal due to increasing trend in gold prices on account of no fear and no future loss. Again exchange rate fluctuations will affect international trade, thus influence the stock market. The study based on secondary data obtained from BSE database, NSE data base and World Gold Council from January 2, 1991 to October 31, 2012. ADF unit root test, Johansen co integration analysis and Granger causality test have been used. The study found that the selected time series are non-stationary and hence provide indication of long term co- integration relationship. Multivariate co- integrating test results indicate that long term co integration stable relationships are present under the study period. In a nutshell, selected variables are closely interlinked. The crude oil price is an essential unpredictable variable that operates as a channel during which the exchange rates and stock prices are associated, with the intention that the oil importing countries policy makers should keep an eye on the effects of changes in oil price levels on their own economies and stock markets. During 1991 to 2012, stock markets crushed due to crises namely Asian financial crisis, global crisis and European crisis but gold prices continued to riseup in India because of safe heaven financial investment.

There exists a relationship between foreign exchange, petroleum and gold price futures. Nasibeh Aghaei et.al (2013) analysed a market independently that is separate from other markets is virtually invalid and the analysts are required to carry out their analyses based on the relations between different markets. Foreign exchange, stock, petroleum and gold markets feature intricate time variables, non-linear and multivariate economic systems. Different agents including political, economic, military, and supply and demand factors affect these markets. Using the daily data from Jan 1st 2002 to Jan 1st 2012, the author studied impact level of fluctuations in other markets (foreign exchange and commodity i.e. crude oil and gold markets) on the stock market fluctuations. Different methods applied are econometric methods of exponential generalized autoregressive conditionally Heteroskedasticity (EGARCH), ADF, Engle-Grangers co integration test and Juselius-Johansen's technique. Analysis results imply an inverse and significant correlation between price index of Tehran stock exchange and global gold price index while foreign exchange rate and crude oil price indices exhibits positive and significant correlation with Tehran stock exchange price index.

Speculative investors follow hedge strategies for crude oil market to minimize loss due to sudden fluctuations. Andre Assis de Salles (2013) examined the performance of bivariate volatility models for Hedging Strategies for crude oil market. Firstly, the author analysed crude oil spot and future returns of the West Texas Intermediate (WTI) type barrel prices. Secondly, volatility of spot and future crude oil returns, the hedge ratio strategy is examined through the hedge effectiveness. The author concludes classical models were implemented to carryout and compare the minimum variance hedge obtained. Among several methodologies this work implemented some alternatives using the bivariate autoregressive model, the vector auto regressive and the vector correction for the average of the future and spot returns. The result of the effectiveness of hedge indicates that the VECH diagonal and vector auto regressive model presented the best results.

Indian stock market influences her macroeconomic variables. Samveg patel (2012) investigated the effects of macroeconomic determinants on the performance of the Indian stock market using monthly data over the period Jan 1991 to Dec 2011 for selected macroeconomic variables like interest rate, inflation, exchange rate, index of industrial production, money supply, gold price, silver price and oil price. Money supply and inflation have a dual effect on stock returns. First increase in money supply will increase inflation, which will again increase expected rate of return. Use of high expected rate of return will decrease value of the firm and will result in lower share prices. Secondly, increase in money supply and inflation rises up future cash flow of the firm, which in turn increase expected dividend and increase stock prices. A depreciation of the domestic currency against foreign currencies increases export, therefore exchange rate should have a negative relationship with the stock return. But at the same time depreciation of domestic currency increase the cost of imports which indicates positive relationship between them. The index of industrial production reflects the growth rate of industries, thus a positive relationship is expected between the index of industrial production and stock return. Increase in gold and silver prices attracts investors towards the commodity market, which might decrease investor preference towards the equity market. This indicates that a negative relationship is expected between gold and silver and stock market returns. Higher international oil price increase the cost of production, which might decrease profit of firms, and hence decrease stock prices. The study applied ADF unit root test, Johansen co integration test and VECM and the study found exchange rate contains some significant information to forecast stock market performance. Therefore, RBI should try to maintain a healthy exchange rate. Index of industrial production is a highly significant factor. Therefore, policy makers should try to support industry growth through appropriate policy. Money supply and inflation are major factors affecting stock markets, so the regulatory body should try to control them through repo and reverse repo rate. Commodity prices like gold, silver and oil are major determinants of stock markets. Mostly prices of these commodities are determined at the

global level, but still by proper import duty and local taxes, policy makers should try to maintain competitive price levels.

Geo-political and economic events influence the spot prices of crude oil. Tarena Musaddiq (2012) attempted to model and forecast the volatility of light, sweet, crude oil futures trading at Newyork mercantile exchange (NYMEX) during 1998 to 2009. It is observed that the spot prices of crude oil have been affected both by economic and geo-political events. The price fall in 1998 that occurred due to a slowdown in Asian economic growth and the price raised owing to curtailed oil supply by OPEC in 2000-2001 and by US Military action in Iraq 2003 with developments in financial markets and the increased use of hedging techniques to manage risks, there has been tremendous growth in the use of derivatives to manage risks related to the volatile energy sector. Futures are one such example the trading of which begin in 1978 on the Newyork mercantile exchange(NYMEX).The light, sweet, crude oil futures contract traded on the NYMEX is used as a key international pricing benchmark due its liquidity and price transparency. The daily price of these futures obtained from the Bloomberg data base. Data on future prices spans the period from 23rd June 1998 to 16th July 2009. The study applied ARCH model introduced by Engle (1982) which models mean and variance of the series. To test the stationarity Dickey-fuller test is applied to the return series and the results show that series is stationary. The study finds the presence of asymmetric effects in the light, sweet and crude oil futures traded in NYMEX. The ARCH model forecast volatility for oil futures are used for hedging and pricing purposes, Asymmetric models are used in the study. Additionally the study found that trading volume and open interest are unable to reduce volatility persistent in these futures.

Growth rate of an economy is influenced by stock and crude oil prices. Muritala Taiwo et al (2012) analysed the impact of crude oil price, stock price and some selected macro economic variables on the growth of Nigeria economy from 1980-2010. The variables are real GDP, growth rate of stock price index by GDP, growth rate of oil price indexed by GDP, interest rate, real exchange rate. Data on these variables were collected from NSE, IMF, NBS (National Bureau of statistics), and central bank of Nigeria statistical Bulletin 1980-2010. Crude oil price was converted from dollars to domestic exchange rate. Ordinary Least Square (OLS), ADF and Johansen co-integration test were used to process data. The study concludes growth rate of GDP is significantly affected by the Real Stock Price (RSP), Real oil Price (ROP) and Exchange rate (EXR). The explanatory power of the growth rate of stock price is larger than other variables. RSP and ROP are connected by interest and exchange rate. The study suggests that the government should diversify the economy from oil reliance to gainful manufacturing in order to minimize the effects of oil shocks.

The stock and crude oil prices are likely to have long run relationship. Krishna Reddy Chittedi (2012) investigated the long run relationship between oil prices and stock prices for India over the period April 2000-2011. Auto regressive distributed lag (ARDL) model have been applied to explore the long run and short run relationships. The author concludes that volatility of stock prices in India have a significant impact on the volatility of oil prices. But a change in the oil prices does not have impact on stock prices.

Emerging stock markets have a profound influence on the exchange rate and in crude oil prices. Syed Abul Basher et.al (2010) examined oil prices, exchange rates and emerging stock markets. The study used Structural Vector Auto Regression (SVAR) to model the dynamic relationship between real oil prices, an exchange rate index for major currencies, emerging market stock prices, interest rates, global real economic activity and oil supply. The results of this paper support to some extent that oil prices respond to movements in exchange rates. Further, the result reported in the paper offered some support for higher oil prices affecting exchange rates in the short run. In particular positive oil shock leads to immediate drop in the trade weighted exchange rate. On the other hand oil prices respond negatively to an unexpected increase in oil supply and oil prices respond positively to an unexpected increase in demand. These results are consistent with the prediction from a demand and supply model for the oil market. Oil prices respond positively to positive shock to emerging stock markets, while oil prices respond negatively to the positive shock. These results are important in establishing, that in addition to global supply and demand conditions for oil, oil prices also respond to emerging market equity markets and global financial capital markets.

A stock return is also influenced by crude oil price. Chung-Rou Fang (2010) examined the dynamic interactions between oil price and stock returns utilizing a Structural Vector Auto regressive Model (SVAR) approach for these large (Newly industrialized economies) NIE, in order to understand the relationship between oil price shocks and Brazil, Russia, India and China (BRIC's) stock market. From the analysis the empirical results suggests that the mean profit of India stock returns is the highest among three economies stock returns. Firstly, the positive mean of the global real activity change rate (4.12%) shows that global demand will increase as oil price rise. This increasing demand effect could explain the global boom in commodity markets in the early 21st century, which was driven by strong economic growth worldwide. In addition the mean oil production change rate (0.05%) shows that the global oil supply shock is also positive, and this means that global oil shock will gradually increase with the higher global demand. Finally, the positive mean of specified oil demand or

supply change rate of all markets could reveal that all three economies oil demand and supply will increase due to their fast economic growth among the three BRIC nations.

Oil and gold prices are likely to have co-movement. Jana sima kova (2010) analysed the relationship between oil and gold price. The aim of this article is to analyse and determine the character of co-movement between the oil and gold price and also the basic characteristic and determinants of current price trends. The author concludes gold as well as oil is influenced by specific factors co-relation analysis confirmed it in case of inflation, industry, interest rate and stock prices of gold mining companies. Least square method verified just inflation regression model. Using Granger causality test, casual links between gold and oil prices levels were identified. Johansen co-integration test reveal long term relationship between examined variables and VECM (vector error correction model) confirmed that after market fluctuations both time series return to long run equilibrium.

Financial markets are influenced by crude oil price in emerging economies. Christine Eva Muller (2009) examined the relations of oil to national economies and financial markets. Following a through introduction about oil price fundamentals, it lays out three strands of research such as research on oil shocks, oil and macro economics as well as oil and stock markets. The author concludes that an extensive outline of oil price fundamentals show that physics and chemistry with related technical aspects, politics and nature itself play a vital role in the world of oil. Manufacturing sector transmits the oil shocks in to a nation. It also put pressure on exchange rate Financial markets can either aggravate or alleviate the impact on trade balances of oil importing countries, depending on the movement and state. Some studies found that energy intensive industries such as transportation is hurt most by raising oil prices and that energy producing industries benefit substantially.

The analyses and discussions of the studies on relationship between oil prices and financial market variables lead to the following conclusions: i) WTI and INR/USD exchange rates have a positive effect on NIFTY and volatility spill over affects only NIFTY and NIFTY affects INR/USD. There is a presence of return and volatility spill over in WTI which dominates spill over in Indian financial sector ii) Financial variables are interlinked with crude price and gold price. During the Asian and European crises gold price found to be increasing in India due to huge demand for yellow metal iii) Stock price and gold price are inversely correlated and foreign exchange rate and crude oil price found positive correlation with stock price index iv) Hedge strategies of investors gained the positive results at the time of oil price volatility v) Exchange rate contains some significant information to forecast stock market performance vi) Trading volumes and open interest are unable to reduce the volatility persistence in light, sweet, crude oil futures trading at Newyork mercantile exchange (NYMEX) vii) Growth rate of GDP is significantly affected by Real stock price, Real oil price and exchange rate viii) Stock prices in India have a significant impact on the volatility of oil prices but oil prices does not have impact on stock prices ix) Positive oil shock leads to immediate drop in the trade weighted exchange rate. Oil prices respond negatively to unexpected increase in oil supply and oil price respond positively to an unexpected increase in demand x) Global oil shock will gradually increase with the higher global demand for oil due to their fast economic growth xi) gold as well as oil is influenced by specific factors. Co-relation analysis confirmed it in case of inflation, industry, interest rate and stock prices of gold mining companies xii) Politics and nature itself play a vital role in the world of oil and oil prices transmit in to manufacturing sector which is national platform to respond to oil shocks which simultaneously put pressure on exchange rate and financial markets by aggravating the trade balances of importing economies.

IV. CONCLUSION

The objective of this paper is to bring out the empirical studies relating crude oil price trend with real and financial sector variables.

Low income countries consume low quantity of oil. Their national output consists of primary sector goods and services which do not significantly depend on energy consumption. So, energy consumption has no relationship with growth of low income countries, while emerging economies are high growth countries rising economic activities need high amount of oil consumption. The emerging economies maintain casual relationship between oil consumption and economic growth.

Oil exporting countries exhaust all their export earnings in buying non-oil essential imports. Export earnings are not available for domestic development. Their national output consists of oil exploration and lacks diversification. In the case of oil importing countries, the rising international oil prices exhaust their foreign exchange reserves which lead to adverse effects.

Oil price and exchange rate exert a two pronged influence on domestic inflation of the countries. Future prices of oil influence its spot price. The spot price changes are transmitted to world countries through exchange rate.

Diesel price forms substantial part of cost of transportation of food items. Thus, diesel price has significant effect on food inflation. Political factors contribute to oil price hike, people of developed countries

use information on political events to form inflation expectations. This strengthens inflationary trend. Strong influence of oil price on inflation makes domestic monetary policy having little control over inflation.

Volatility in oil prices are linked with derivative markets. This brings volatility in to macroeconomic scenario of all the countries. Macroeconomic uncertainty affects economic activities of all the countries.

Financial markets of all the countries are interlinked. Oil derivative markets of USA influence the oil, stock and exchange derivative markets of all the countries. Volatility is being transmitted to other countries through financial markets. One interesting phenomenon found by some studies is that stock prices maintain a negative relationship with gold prices. The empirical studies further offer that there exists long run relationship between oil prices and financial sector variables.

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