Chapter 2:

Literature Reviews

2.1 Overview

In this literature study, firstly, we shall take a look at studies on the effect of commodity prices shocks on the GDP in general. In addition, we also take a look at studies on the effect of price inflation (assuming that commodity price inflation is similar to a general price inflation) on the economy, specifically, the GDP.

Secondly, with those results in mind, we shall explore previous literature regarding the relationship between oil price shocks and GDP. Among the subject approached were the effect of oil price shocks on the GDP, the magnitude of such shock and transmission mechanism involved, and also the role of monetary policy in the oil-GDP relationship.

Thirdly, we shall look at a studies on the gold prices, more specifically, the few studies on the gold prices such as the gold standard, the arguments for and against the gold standard, its effects on the economy and implications of a gold price shock.

2.2 Literature on Commodities Prices in General

Classical economists suggested that the long-run trend of raw material prices will always be rising, because of limited supplies of natural resources in the face of diminishing returns to commodity production and growing populations. However, on the contrary, the Prebisch-Singer (1950) hypothesis argued that there was a declining long-term trend in primary commodity prices relative to manufactured goods, owing to the low income elasticity of demand for commodities and rapid increases in supply. Nevertheless, in practice, the

historical evidence in support of a persistent downward trend in relative commodity prices is rather mixed, as the commodity prices have been rather volatile over the years.

Cashin, Hong Liang and McDermott (2000), in their study of the persistence of shocks to world commodity prices, advocated that movements in commodity prices are a key determinant of the performance of the world economy. Commodity prices movements affect the level and stability of export incomes earned by developing countries, the cost of inputs to production in industrial countries, the allocation (sectoral and spatial) of world capital flows, and in particular rates of national economic growth. Using monthly International Monetary Fund data on 60 commodity price series over the period 1957–98, their study found that shocks to the prices of many primary commodities are typically long-lasting, and that the variability of the persistence of price shocks is quite wide. Consequently, it is incorrect to view shocks to commodity prices as generally being temporary phenomena that largely reflect short-lived variability in supply interacting with relatively unchanging demand. Notwithstanding this, the persistence of shocks to commodity prices does vary greatly across commodities, with crude oil, gold, tree crops and metals typically having long-lasting shocks, and softwoods typically having short-lived shocks.

Their paper also discussed the importance of the knowledge of the persistence of shocks to commodity prices as an important input into the design of stabilization schemes to ameliorate the real macroeconomic effects of such shocks, particularly in developing countries. If shocks to commodity price series are extremely persistent, then an adverse price shock to any given commodity is likely to engender depressed prices for a long period of time. In such circumstances, government-supported price-stabilization activities and compensatory financing are likely to be ineffective, and external borrowing for consumption-

smoothing is likely to be unsustainable. Even where shocks to commodity price series are relatively less persistent, the likelihood that the benefits of smoothing the path of domestic prices (given world commodity prices) exceed the cost of operating stabilization schemes or servicing external borrowing remains open to question. Moreover, while our results do not entirely rule out the successful operation of stabilization arrangements for many commodities, they do highlight the potential risk that such schemes will confront shocks, which last longer than typically observed, and thus may not be financially sustainable.

Meanwhile, Bjornland (2000) found that that shocks to oil and gold prices are typically long-lasting and the variability of the persistence of price shocks is quite wide. Both long-term trends and short-term fluctuations in primary commodity prices are key determinants of developments in the world economy. For commodity-dependent countries, knowledge of the duration of such shocks is an essential input to the design of policies to dampen the domestic economic effects of external shocks. Bjornland used data on 60 indices of primary commodity prices over the period of 1957 to 1998 in his research.

The econometric procedures of the paper are fourfold. Firstly Bjornland used the median-unbiased estimator proposed by Andrews (1993) to obtain an exact point and interval estimate of the autoregressive parameter in the commodity price data. Second, using unbiased estimates of the autoregressive parameter, scalar measures of the duration (in terms of the number of periods) of typical price shocks, and the exact confidence interval surrounding the estimated median duration of shocks were calculated. Third, using Monte Carlo methods, the median and 90 percent confidence interval of the median function of the autoregressive/unit root model, for those cases when there are between 300 and 500 observations were estimated. Fourth, the duration of shocks to individual commodities, rather than aggregate indices was

the main focus, as the persistence of shocks to aggregated series can differ greatly from the persistence of shocks to individual time series. The result was that, on average, shocks to commodity prices are very long-lasting. For the majority of individual commodities it typically takes more than five years for half of the effect of the initial shock to dissipate. Moreover, the confidence intervals surrounding the estimated median duration of price shocks are typically quite wide, indicating that the persistence of shocks is variable in length.

Chowdhury and Malikk (2001) conducted tests on the inflation and economic growth relationship in four countries namely Bangladesh, India, Pakistan and Sri Lanka. The author found evidence of a long run positive relationship between GDP growth rate and inflation for all four countries. More importantly, they found that sensitivity of inflation to changes in growth rates is larger than that of growth to changes in inflation rates. These findings have important policy implications. Contrary to the policy advice of the international lending agencies, attempts to reduce inflation to a very low level (or zero) are likely to adversely affect economic growth. However, attempts to achieve faster economic growth may overheat the economy to the extent that the inflation rate becomes unstable. Thus, these economies are on a knife-edge. The challenge for them is to find a growth rate which is consistent with a stable inflation rate, rather than beat inflation first to take them to a path of faster economic growth. They need inflation for growth, but too fast a growth rate may accelerate the inflation rate and take them downhill. Assuming that general price inflation is similar to commodity price inflation, this study implies that commodity price shocks indeed have effect on the GDP.

On the contrary, in Fischer (1993), Barro (1996), Bruno and Easterly (1998) cross-country studies, inflation was found to affect economic growth negatively. However,

according to Fischer and Barro, there was only a very small negative impact of inflation on growth. Yet Fischer concluded "however weak the evidence, one strong conclusion can be drawn: inflation is not good for longer-term growth". Barro too preferred price stability because he believed it to be good for economic growth.

2.3 Literature Regarding Oil Price Shocks

With regards to the subject of oil price and GDP, one of the most profound research in this field is by Hamilton J.D., whose works dates back to 1983. Hamilton (1983) examined the stability of the regression relationship between nominal oil price changes and the logarithm of real GNP and was the first to observe the weakening oil price-GDP relationship over time in US. He also examined Granger causality between oil price changes and various macroeconomic indicators. Hamilton separated 1948:2-1980:3 into two sub-periods, 1948-72 and 1973-80. Statistically significant relationships between oil price changes and GNP characterized both periods, but estimation of the full period yielded smaller coefficients than either period estimated separately. For both periods separately, the third and fourth quarter lagged oil price coefficients were significant at 0.01, and the 2nd quarter lag at better than 0.10. For the earlier period (1949:2-1972:4), the oil-price coefficients at the second, third, and fourth lags are -0.082, -0.170, and -0.177; for the latter period (1973:1-1980:3), those coefficient values are -0.038, -0.078, and -0.115.

Later, Mork (1989) discovered that the oil price variable in Hamilton's model did not perform as well when the sample period was extended beyond 1986 as when the sample ended before that year. The 1986 oil price collapse has indeed served as an intriguing counter example in the literature on the macroeconomic costs of oil price shocks. Further study of the oil price-GDP relationship beyond the 1980s by Hooker (1996) helped identify the changes in

the statistical relationship of Granger causality of GDP by oil prices. The interaction of his work with Hamilton's in particular has refined the statistical definition of an oil price shock, which in turn has played a critical role in establishing a stable statistical relationship between oil price shocks and GDP. More importantly, it has paved the way for studies of transmission mechanism. More importantly, the attention to the role of oil price shock specification in the stability of the oil price-GDP relationship has interacted with the microeconomic models of transmission channels to improve the understanding of how oil prices might influence macroeconomic aggregates such as GDP and unemployment.

Mory (1993) in his exploration of asymmetric macroeconomic responses to oil price changes in the US, estimated a simple regression of GNP on the oil price, with a one-year lag (both variables in first logarithmic differences). Using a sample period of 1951-1990, he obtained a GNP elasticity of -0.0551, highly significant statistically. Over the period 1952-1990, the GNP elasticity of oil price *increases* was -0.0671, again statistically significant.

Several analysts have noted that the post-war relationship between oil prices and GDP, as well as other economic indicators changed sometime in the 1980s. Rotemberg and Woodford (1996) observed that after 1980, OPEC lost its ability to keep the nominal price of oil relatively stable, hence paving the way for a structural break in the oil price-GDP relationship in the US. The meaning of this change in the oil price-GDP relationship is quite important, as it can be interpreted as oil prices that once affected GDP, for some reasons, but do so no longer.

On closer scrutiny, after 1980, variations in the demand for oil were reflected quickly in nominal price changes, and several statistical properties of oil prices changed as a result.

The alternative interpretation is that the relationship was never particularly simple, but that pricing conditions in the world oil market from just after World War II through the late 1970s let simple, linear versions of the relationship approximate the observed behavior. When more flexible behavior appeared in the world oil market, price signals that would have meant one thing in the previous period changed their meanings to market observers, and becomes more complicated.

Hamilton (2001) furthered his study on this topic, applying a parametric statistical technique for specifying and testing hypotheses about flexible, nonlinear regression specifications. In his paper, he mentioned that in 1996, he applied kernel regression techniques using both change and net-change oil price variables to find a functional form that would vary with magnitudes of the data[1]. This was done to ensure that the functional form would not restrict the oil price-GDP elasticity to be a constant value over an entire time period, during which vastly different oil-price-change behavior may have occurred. That effort involved a combination of linear (oil price change) and nonlinear (NOPI) variables but did not permit statistical inference regarding the satisfactoriness of the functional form, or even straightforward presentation of the results. To remedy these problems, Hamilton developed a technique for determining whether a relationship is nonlinear, what the nonlinearity looks like, and whether it is adequately described by a particular parametric model. The technique allows linear specification of some variables if it suggests that the relationships involving them are linear but lets the data themselves determine the precise functional form of other. To summarize a detailed study, Hamilton found that both the LNR and the NOPI (extended from one- to three-year comparisons) yielded stable relationships with GDP over the entire sample period.

[1] A paper presented in 1996 Department Of Energy Conference. Hamilton's paper has helped refine the statistical definition of an oil price shock, which in turn has played a critical role in establishing a stable statistical relationship between oil price shocks and GDP.

Hooker (1996)'s contribution to the study of the oil price-GDP relationship has been to identify the changes in the statistical relationship of Granger causality of GDP by oil prices over the years. Hooker's study of the Granger causality of GDP from oil prices spanned five years, amids various testings on the NOPI and LNR specifications. Hooker's study found that both the LNR and NOPI specifications restored for the entire post-war period the Granger causality of GDP from oil prices and which he found to exist, in the pre-1980 period. In his second and third tests, Hooker (1999) found that neither the LNR nor the NOPI specification Granger-cause GDP in the 1980-1998 sample. However, he does find that both specifications Granger-cause GDP in annual data in regressions on oil prices alone.

Hooker (2000), in an extension to Hooker (1996), studied the performance of the NOPI and LNR specifications. Although both specifications Granger-caused GDP from 1950 through 1998, Hooker (2000) subjected them to three further tests: the sensitivity of the Granger-causality result to a single, particularly influential data point early in the sample; Granger-causality in the post-1980 period only; and out-of-sample forecasting of unemployment in the 1990s using realized values of the two oil price shock specifications. He found that removal of 1957:1 substantially weakened the performance of both specifications. As Hooker notes, that price change was only about 10 percent, but it appeared after a period of very stable prices and hence a low conditional variance as measured by the LNR specification, and it was followed by a recession beginning in August and an 11 percent fall in GDP in 1958:1. Although removal of this data point substantially changes the statistics calculated, it seems that both the LNR and NOPI specifications capture the surprise content of this oil price change, which was followed clearly by substantial recessionary movements. In the final analysis, he interprets this finding as indicating that quarterly changes in GDP are

quite "noisy" and that oil price shocks have their effects on longer-term trends in output over the entire period 1979:1-1998:4.

An empirical study on the oil price shock's transmission mechanism that was done by Davis & Haltiwanger (2001)[2] proves to be vital in the understanding of the impact of oil shocks on the economy. Its empirical base is quarterly, plant-level Census data from 1972:2 to 1988:4 on employment, capital per employee, energy use, age and size of plant, and product durability, at the four-digit SIC level for US. They used vector autoregressions (VARs) to examine the response of job creation and destruction to separately defined, positive and negative oil price shocks. D&H's examination of job creation and destruction separately leads them to the conclusion that there exist two transmission mechanisms, namely the aggregate and allocative transmission mechanisms. The aggregate channels are potential output, income transfer, and sticky wage effects emphasized by traditional macroeconomic analyses. For example, an oil price increase shrinks potential output since the price increase is equivalent to a reduction in resources available. Income transfers operate through relative price changes, and sticky wages refer to the effects of labor contracts on the ability of the labor market to adjust employment and earnings to demand or price changes. On the other hand, allocative channels involve the effect that oil price changes have on the closeness of match between firms' desired and actual levels of labor and capital. For example, an oil price change, in either direction, can alter the mix of labor skills that a firm possesses, given its capital stock. In short, the aggregate effects of an oil price shock reduce job creation and increase job destruction, while the allocative aspects increase both creation and destruction.

[2] Their study was done in response to earlier studies by Lilien (1982) and Hamilton (1988) as well as an empirical work by Loungani (1986). The Davis and Haltiwanger (2001; D&H) study is a revision of the study they prepared for the 1996 DOE Conference on Oil Security.

In addition, D&H also found that both oil-price and monetary shocks cause larger responses in job destruction than job creation in nearly every industrial sector. However, the magnitude of effect of oil price shocks is about twice that of monetary shocks, and the response of employment to oil price shocks is sharply asymmetric, the response to positive shocks being ten times larger than that to negative shocks. Hence we can conclude that, based on their study, that monetary policy responding to oil price shocks; rather than the oil price shocks themselves; is responsible for the GDP loss in the ensuing recessions.

In another study of the mechanisms of effect of oil shocks, Rotemberg & Woodford (1996) and Finn (2000) did a theoretical, simulation model of an aggregate economy to find mechanisms that will allow oil price shocks to have the magnitude of effect on output. R&W note that, empirically, a 10% improvement in the price of oil reduces output by 2.5%, 5 or 6 quarters later; but that their 1-sector model, with perfect competition, can yield only a ½% output reduction for that price increase. Meanwhile, Finn (2000) came out with alternative specification of an aggregate model avoids tying the magnitude result to noncompetitive conditions. Finn found that an oil price shock causes sharp, simultaneous decreases in energy use and capital utilization.

His conclusion was based on a chain of cause and effect. Firstly, the decline in energy use works through the representative firm's production function directly, reducing output and labor's marginal product. The fall in labor's marginal product reduces the wage, which in turn reduces labor supplied. Hence, a permanent rise in the oil price causes lower of energy use because capital utilization and labor supply will be propagated into future use. Working through the production function, these reductions depress capital's future marginal product, causing a fall in capital's future marginal return and reductions in investment and capital in

the present but extending into the future. The lower energy use, through an indirect transmission channel, working through the capital stock, is related to capital's marginal energy cost, also affects returns on investment (ROI). This rise in capital's future marginal energy cost (since the price increase is permanent) prompts further reductions in ROI. The oil price increase's effects on output and wages are potentially significant and long-lived too, since they operate on the capital stock.

On further studies on the monetary policy in relation to oil shocks and the GDP, Hamilton & Herrera (2001) found that monetary policy plays an important role in sustaining GDP level after an oil price shock. Based on their VAR (vector autoregression) simulation model, H&H concluded that most, if not all, of the reduction in GDP during the recessions following those episodes was attributable to monetary policy rather than the oil price shocks themselves. Visual inspection of the impulse response functions for the oil price shock for the variables in their VAR showed that had the Fed maintained the funds rate at the pre-shock level, most of the GDP response to oil price over the 1973, 1979-80, and 1990 episodes would have been avoided.

Hooker (1999, 2000) has looked into the possibility that systematic changes in monetary policy since the late 1970s may have been responsible for the change in the oil price-GDP relationship[3]. In Hooker's findings, the structural break in the oil price-GDP relationship after 1980 was because oil prices have operated through monetary policy, as well as other indirect channels, and not directly affecting GDP, like in the pre-1980 period. Besides that, Hooker's study on the influence of oil prices on inflation ("core" inflation

[3] Hooker found that there is a structural break in the oil price-GDP relationship after 1980 in his study of the relationship over the period 1954-1995.

excludes energy prices) has also shed light on the issue. Paralleling the structural break he found in the oil price-GDP relationship around 1980, he identified a break in the U.S. Phillips curve relationship, augmented with oil prices, around the same time, with oil price changes making a substantial contribution to core inflation before that date but little or none thereafter. He explored the suitability of three explanations for this break: declining energy share, deregulation of energy-producing and -consuming industries, and changes in monetary policy. None of the three hypotheses could account for the decrease in pass-through after 1980; in fact, he found that monetary policy as represented by the federal funds rate displayed smaller, rather than larger, responses to oil price changes after 1979, despite its greater sensitivity to inflation. Hooker noted that BGW also reported this falling sensitivity of the federal funds rate to oil price shocks over time.

2.4 Literature Regarding Gold Prices

Meanwhile regarding the literature on gold prices, we shall look at the gold standard, its advantages and the reason it failed and was taken over by a flexible exchange rate regime. According to Meissner (2001), in the Oxford Encyclopedia of Economic History, the gold standard was used because of a few reasons. The British, the first advocate of the gold standard back in 1821, chose gold rather than other commodity-based monetary system because compared to the bimetallism system used prior to the gold standard, for each nominal purchase value, less-weight would have to be carried. This alleviated the need to maintain true bimetallism since token, rather than full-bodied coins could be used for trade transactions. Prior to this token coins would have been too easy to counterfeit and bimetallism would not have allowed concurrent use of silver and gold. England had trade transactions that were on average larger than other nations, therefore benefiting from having such a monetary system. In other countries, subsequent trade development may have

generated similar preference for gold. In addition, England's implementation coincided with the its the inherent quality of gold- rare, valuable and durable. The option to use silver was not viable because at that time, the price of silver was volatile and subsequently, would have damaging effect on the economy.

Other research highlighted transaction costs factors are Flandreau (1996), Eichengreen & Flandreau (1997) and Meissner (2001). Gold standard could lower the transaction costs of trade as coordination lowered exchange rate hedging costs and saved commissions on, say, trade of silver for gold. For example, early joiners to the gold standard like Scandinavia and Germany had high and quickly rising levels of trade with Great Britain (on gold), and they cited this as one key factor in their support for a gold standard. According to Bordo & Rockoff, (1996), in international capital markets, the gold standard may have generated credibility much as a currency board or dollarization is believed to do today. Gold convertibility served as a signal to foreign investors that countries would pursue policies compatible with convertibility and not generate unsustainable debt levels or wild outbreaks of inflation. The result was that countries could lower their borrowing costs by adopting this "good-housekeeping seal of approval." The gold standard is said to have generated low exchange rate volatility and made business more fluid and less costly for international financiers and commercial agents. During its epoch, the classical gold standard is widely seen to have contributed to the smooth equilibration of balances of payments worldwide.

Among Meissner's theories on the disenchantment of gold standard is London's displacement by New York as a world financial center, thus eliminating England's capacity to maintain global balance though movements in its discount rate. Also cited was that the quality and quantity of stability enhancing co-operation associated with the gold standard

were eroded due to war-time animosities and reparations difficulties. The displacement of these permissive structures made the gold standard in its traditional form less credible. In addition, it became difficult to sustain a hard peg in the face of mounting political pressures to follow stabilization policies. The diverse experiences during the Great Depression, when the gold bloc appears to have had much weaker macroeconomic performance than the "floaters" furthered the sentiment. World War II killed any remaining hopes for a lasting system of global convertibility such as the classical gold standard. The Bretton Woods system that rose from the ashes of the inter-war experience looked nothing like the hard pegs of the nineteenth century. At that time, only the dollar was made freely convertible into gold. Capital flows were largely restricted and adjustable peg was introduced to solve cases of persistent balance of payments disequilibria.

Furthermore, the gold peg failed to solve problem of persisting deficits. John Stuart Mill's pedagogic price-specie flow mechanism is often invoked as a tool to explain how the gold standard kept countries out of long-run balance of payments trouble. Mills theory did not work in practice and arbitrage in securities markets as in goods markets was found to be efficient in ruling out momentary deficits and disequilibria. Central banks role in restoring balance of payments equilibrium by manipulating domestic interest rates also took prominence, hence further causing the unpopularity of gold peg.

Today, gold-advocates still reminiscence the old days of stable price-levels and high growth during the gold standard. In terms of trend growth, the classical gold standard contributed to a historically unprecedented period of high productivity improvement and extreme deepening of integration in capital and goods markets. In terms of commercial integration, contemporaries argued that harmonization of all nations on a gold standard would

save transaction costs of trade such as brokers' fees or exchange rate hedging costs. Empirical evidence from López-Córdoba and Meissner suggested that the global reduction in these frictions unequivocally and significantly contributed to nineteenth century globalization. Nevertheless, the truth was that in terms of price stability, the gold standard simply did not achieve it. Bordo and Kydland (1995) dubbed the gold standard a contingent rule, and temporary abandonment of policies compatible with the hard peg was crucial in the face of economic turmoil like during the war. The gold standard inspired the attempt to maintain stable exchange rates, and this was no doubt because of perceptions embedded in policy makers' minds that the classical gold standard catalysed excellent economic performance.

Gillman and Nakov (2000) did a study on the effect of inflation on oil and gold prices in the post-war period. According to them, the rises in oil and gold price, including those during the "oil shocks" in 1974 and 1979, could be explained as a consequence of US inflation. Gillman and Nakov looked at postwar US data (1959-1999) in the context of a general equilibrium monetary model, and found that oil prices, gold prices, and inflation rates all showed similar movements including throughout the Stagflation period. From the beginning of the 1970s the price of oil jumped by over 400% from $3.4 per barrel in December 1973 to $13.4 in January 1974. It remained at that level until the second rise that started around November 1978 from $13.8 per barrel to $39.6 per barrel in November 1979, amounting to another 300% increase. The price of gold displayed a nearly 500% increase from $35 per ounce in January 1970 to $174 per ounce in December 1974. It troughed at $110 in August 1976, doubled to $220 in November 1978 (before the second "oil shock"), and peaked at $675 per ounce in January 1980, more than a 300% increase. Annual US inflation accelerated 300% from 2.9% in June 1972 to 8.8% in December 1973 (before the

first "oil shock"). After troughing at 4.8% in December 1976, it rose to 14.7% in March 1980, another 300% increase. They also found that the US dollar M1 money supply is cointegrated with the US CPI change over the 1959-1999 period and its rate of growth Granger causes the US CPI inflation rate at the 5% level of significance.

The paper proposed that the money supply change is a candidate for the "exogenous" event that may lie behind oil price, gold price and inflation rate movements. Hence, this indicates that money growth caused the inflation rate increases and so we can frame the inflation theory of oil prices as being synonomous with a money supply theory of the oil price movements. Granger causality and cointegration evidence also support the model's prediction that when the nominal, US dollar, contract price of oil prices is sticky, the oil price "jumps" with changes in the US inflation rate, while moving with the general price index when nominal prices are flexible. Correlation evidences and Granger-test proved the hypothesis that inflation was a cause rather than a consequence of the increase in the prices of oil and gold.

Redish (2000) explored the relationship between the price and growth experience of the United States 1870-1913, when both countries adhered to the international gold standard and found that the domestic price level was largely determined by international (exogenous) forces. In addition, neither country had a central bank which could intervene in the gold market to shield the domestic economy from external conditions. Using the Blanchard-Quah methodology, she identified separate supply' shocks, money supply shocks and demand shocks by imposing long run restrictions on the impact of the shocks and on output prices. A historical decomposition was done to examine the impact of each shock on output. The key conclusion of our analysis is that where either prices fall because of a positive supply shock,

or prices fall because of a negative demand (money) shock does not capture the complexity of the historical experience of the pre-1896 period. Indeed, we find that prices fell as a result of a combination of negative money supply shocks and positive supply shocks. The results for the U.S. are clear: the different rates of change in the price levels before and after 1890 are attributed to different monetary shocks, but these shocks explain very little of output growth or volatility, which is almost entirely a response to supply' shocks.