Does The inflation cycle influence the global Business cycle through Commodities Market : An application of RBC Model

Abstract

Keywords

Introduction

The vulnerability of the financial stability towards any risk might arise shed the light about the linkage between the global demand and the financial stability as a key factor that influence the economic system and the trend of the business cycle. Studying the business cycle is the top macroeconomic topics which are inter-linked for any economic and non-economic issues might arise. The concept of the business cycle is a macroeconomic concept based on different definitions with reference to the context referred to such as the macroeconomic variables: investment, inflation, consumption, GDP, and production. Within this study, we will refer to the business cycle within the GDP. Schumpeter (1939) is initiating the concept of the business cycle through the innovation cycle in the economy as "innovation clusters". The long cycle in the economy is complemented by Mensch (1979), Hausten and Neuwirth (1982), Van Dujin (1983) and Kleinknecht (1987) by further empirical studies. Clarke et al, (1981) pointed out an increase in the number of critical innovations during the recovery of the long cycles. Singer (1998) has complemented the theory of long cycle by finding that the trade gaps between standardized and innovative products follow a deteriorating trend. The application of these studies in the commodities economy has bring an important literature with different approaches. The fluctuation of the long cycle and the commodities have lay an important role in the variation of the intensity of use of productive inputs, where the commodities such as the precious metals and the energy has played a relevant role. For the expansion phase, the expanding demand for precious metals drags prices upwards. Respectively in the new period of stagnation, the intensity of demand drops as well as the prices of precious metals. It is by analogy applying as well for the energy sector as well as the financial market. Studying the long cycle of commodities as well as the financial cycle and their connection to the global economic dynamics is an area to be more and more explored, as these sectors are open for more interconnected development. Within this context, this article is novel as it might contribute to an area of little research, which is less studied by combining the commodities market and the financial market. The macroeconomic impact of the commodities on the business cycle has been studied in isolation or within the monetary policy but not in conjunction with the standards of business cycle.

Studying the inter-link of the commodities and the business cycle is a big literature with different empirical approaches studies and theoretical focusing on detecting the breaks of the time series components. Therefore, decomposing and forecasting the business cycle within the commodities and the stocks frame can be efficient for the policy decisions and the synchronisation of the interference and the trade-off between the concerned targeted policies. The business cycle is considered as the main framework for evaluation of the economic system in general and the policy makers. Our attempt in that paper is interlink the financial sector and commodities with the business cycle to give more-clear overview about the economic system in general. The interdependence between the business cycle and the financial cycle was with a prominent literature taking the credit gap and the house prices as a reference for the financial sector, (Borio, 2012) (Claessens, Kose, &Terrones, 2011) (Rabanal and Taheri, 2015) (Borio, Disyatat, and Juselius, 2013, 2014). Within our studies, we are referring to the stock prices for the financial cycle. Several literature treat the stock market and the commodities apart for the inter-link with the business cycle of the economy. The study of the volatility of the business cycle allow for more vulnerability towards any economic and extra-economic shocks such as the buoyant of the stock market and the pro-cycle of the commodities.

Within this paper, we aim to investigate the impact of the energy commodity such as the crude oil and the non-energy commodity such as the gold on the global business cycle. It is RBC model .

The paper structured as follow. The first section, we devoted for the literature review. The second section dedicated for the modelling using the RBC model. The third section devoted for the simulation of the model. The last section reports our numerical results and contains a discussion of further policy recommendation and concluding remarks.

1- Related Literature

Our study construct on a large literature, which is focus on the business cycle, the energy commodities such as the oil and the non-energy commodities such as the gold.

The inter-link between the financial sphere and the real sphere within the economic activity, shed the light about any macroeconomic or monetary policy is conducted. Gold is a traded asset globally as alternative investment class to the ordinary portfolio comprising stocks and bonds; Baur and McDermott (2010) argue that gold is a stabilizing factor for the financial system since it minimize losses for market participant and portfolio managers in the event of negative market shocks. Beaudry et al (2011) argue that the metaphor of profit driven by fluctuation called gold rushes provide period of economic boom associated with expenditure aimed at securing claim near new found vein of gold. Pierdzioch et al (2014) find out that the international business cycle has out-of-ample predictive power for gold price fluctuations. Apergis et Eleftheriou(2016) find out that the business cycle asymmetrically affect gold return, while these return respond stronger during the

recessionary than booming phases of the cycle. Within the same perspective applying for a several type of precious metal such as gold, silver and platinum, Kucher and McCoskey(2016) find out that the cointegrating relationships between precious metal price are not stable over time with significant shift in the price relation around business cycle peaks and during recessions. Witin the last decade, after the oil shocks petroleum crisis, the constraint of adjustment within the capital market have probably less influenced on the size and level of stocks trading which for some countries targeted their policies for the optimum arrangements for their portfolios. For the policy economic makers; they have to take their decisions on the volume and pricing of oil with the desired level of oil revenues and their use (consumer goods, investment goods, and financial investments). The interlink between the oil as a main key for the financial sphere and the real sphere have been documented in several studies within the impact on the volatility of pricing oil on the business cycle. The oil is acting as the hedge fund for several investments, the inter-link with the cyclicity of the economic system as a source of the business cycle is a topic for a prominent literature review. Hamilton (1983) are shedding the light about the oil as a source for the business cycle for the case of the US, by finding out that an increase in the oil leading to recession in the US. The volatility of oil price such as the increase have a positive effect on the output of the exporting countries (Bermunent et al, 2010). The prominent studies are Esterlla and Hardouvelis (1991), Esterella and Mishkin (1998), Chauvet and Porter (2005), Nyberg(2010) and Ng(2012) are studying the impact of oil price shocks on business cycle fluctuations, by modelling the probability of the recession and the probit and logit model as binary dependent variable models. The main result of these models are identifying the term spread and stock market returns as useful predictor of US recessions. Michael (1993) find out that shocks of the oil price explain the reduced fraction of the real GNP growth and inflation variance in US and Japan. Sadorky(1999) find out that oil price volatility shocks have asymmetric effects on the market activity. From different empirical approach Elder and Serletis (2010) argue that oil price volatility has a negative and statistically significant impact on several measures of investment, durable consumption, and aggregate output. Moreover, using a GARCH-in mean empirical method, Elder and Serletis (2010) find out that the volatility in oil price shocks have negative and statistically significant effect on different measures of investment, durable consumption, and aggregate output. Jo (2014) show that the negative effect of oil price uncertainty shock on world industrial production using a quarterly vector autoregressive model with stochastic volatility in mean. In the same perspective, using the oil supply and demand shocks Chortareas and Noikokyris (2014) estimate the US dividend yield components. Using a measure oil market uncertainty, Yin and Feng(2019) study the dynamic relationship between oil market uncertainty and international business cycle , the authors find out that oil market uncertainty have a linear leading effect on the international business cycle. Ponka and Zheng(2019) study the role of oil price on forecasting Russian recession period using Probit model. The author suggest that fluctuation in nominal oil price are useful predictor of the Russian business cycle,

find out the term spread turn out to be the most powerful predictor of future recessions.

Our contribution to the literature by sum up the two sources of international business cycle such as the gold and the oil on the trend of the international business cycle, using the RBC model.

2- The Business cycle and the commodity

The Schumpeter theory bring an overview about the business cycle, the trend of an economic system. According to Schumpeter (1935) the business cycle is a sum of perpetual economic cycles, or overlapping cycle. His main theory is focusing on the business cycle within the process of creative destruction, for which the introduction of innovation boost investment opportunities and create economic growth and at the same time decay in the obsolete sector of production. This process is containing an expansion phase and a recession phase where the economy assimilate the innovation across sectors. The commodity prices are involved in the same perspective regarding the demand. Within the expansion phase, the competition for commodities product such as the gold and the energy tend to increase their price comparing to the manufacturing goods, the introduction of the innovation as imitation reduce of the opportunities investment in order to obtain economic rent decrease the demand for commodities. Schumpeter is among the economist who reject the frame that the decline in prices might be a result of slow-down in terms of output and growth, as he explain that within the great recession (1978-1896) for the case of the falling of price due to a decline in the production of gold which result in profit squeeze and the decrease of the investment. At the same perspective as Schumpeter, for the economic phase of the commodities and the manufactured good on the business cycle, We find Singer and Prebisch(1950), as well as Ocampo(1986) and Ocampo and Parra(2003) as prominent literature studying the commodities prices and the business cycle.

According to the IMF five years ahead forecast, 2017, the expected long-term growth boosted by the boom of the commodity price has been revised down from 4% to 3%. The boom in the commodities price have an increase effect in the short run on the real GDP by raising the value and production and lifting the demand for ancillary goods and services. An increase in the investment in resource sector, such as metal or energy, may raise the potential output, which in turn boost the financial resource for the investment at the other sector. However, in the long term, commodities boost the growth is a controversial question. According to Corden(1984), the positive term trade and income shock associated with commodity boom shift production out of non-commodity tradable and into the non-tradable service sectors with lower productivity . The global economic crisis starting from 2012 was the result of the boom in the commodity prices characterized by unprecedented magnitude and duration, as the price reached the highest level in the history, this phase was charaterized as a phase of mineral boom. In fact, within the depression of the global

economy after the Subprime crisis, which slow down the demand for of the commodity price, however the recover for the price was surprisingly fast and the world economy experience a boom in commodity prices which might be seen as a continuation of 2004-2008. The upswing demand in the commodity lifting the resilience of growth performance of major developing countries and producers countries. Within the several literature it is tempted to believe that there are causality link between the business cycle in term of output and the commodities.

Within the ominence of the successive financial and non-financial crisis, the international monetary system are facing a new challenging towards the general equilibrium of the economies as well as the whole economy. The dollarization as international monetary policy focusing on the substitution of the currencies in order to absorb any potential crisis might arise due to the macroeconomic instability. Targeting the economic system towards the dollarization might bring some challenges as it influence the volatility of the exchange rates and the stability of the money demand. The dollarization policy bring references to different channels at the same time for the monetary policy at the same time: a high level of dollarization brings more volatile exchange rates and a stronger pass-through from exchange rates to prices, and the interest rate channel might become weaker as holding foreign currency denominated assets makes local economic agents less sensitive to changes in interest rates on domestic currency assets; Horvath and Maino (2006). From the public finance, the dollarization policy might be an effective instruments for the inflation: while the power spending is limited by the willingness of domestic residents to hold domestic currency, the dollarization system preclude a government from using an inflationary tax to finance its expenditure programs, Harrison and Vymyatnina (2007). The authors find out that foreign currency cash transactions can encourage tax evasion and shift the economy to underground activities. The currency substitution allow an inflation targeting regime to be implemented, Leidermain, Maino and Parrado (2006). Withn that study, we are focusing on the impact of the dollarization system as policy for targeting the inflation. The fact that the economic agent stick to use the foreign currency in all its roles after the inflation is bought down even to the point of sustained price stability, Calvo and Vegh (1996). The authors explain that the lack of reversibility is known as hysteresis since the end of the inflation does not necessarily ensure the end of dollarization. According to Adenutsi, D. E., & Yartey, C. A. (2007) the high demand for the foreign currency convert a major challenge for policymakers: although the use of other currencies as store value , unit of account or medium exchange, however this is followed by macroeconomic instability within the volatility of the inflation. Omgena, Schindele and Vonnak (2015) find out that the dollarization _ the widespread holding of assets and liabilities in a foreign currency is considerend as constraint on monetary policy and a source for financial stability. In the same perspective (Garcia Escribano and Sosa, 2011) consider that after the global financial crisis policy makers have emphasized the need to dedollarize deposits and loans, the

monetary policy with low and stable consumer price inflation is often seen as a key ingredient to kick-start de-dollarisation. Rossini et al (2016) argue that the existence of an extended practice of keeping prices in dollars generates important complications to the objective of price stability, given the greater uncertainty about the pass through of a depreciation to inflation and about the feedback loops of these variables with inflation expectations. It is within the global financial crisis of 2008, there are reconversion towards the dollarization as policy for targeting the inflation for recommending the de-dollarisation. However the start of the dollarization system within the 90 documented in many studies that is an optimum policy for keeping the inflation down and even the sustainability phasis. Introducing a key parameters to absorb any eventual crisis that can influence the exchange rate and the inflation is one of the instruments for sorting out this dilemma. We are taking the inflation cycle as a reference for sorting out the cyclicity of it on the economy. The theory of long cycle recommend that the trade gaps between standardized and innovative product follow a deteriorating trend, (Singer 1998). The application of this theory to the commodities has bring an important literature with different approaches. The fluctuation of the long cycle and the commodities have lay an important role in the variation of the intensity of use of productive inputs where the commodities such as the precious metals and energy have played a relevant role. For the case of the precious metals such as the gold, in the expansion phase the higher demand for the gold drags prices upwards; respectively in the period of stagnation the intensity of demand drops as well the prices. It is in the same perspective for the case of energy, as well as the financial market. The interlink between the oil as a main key for the financial sphere and the real sphere have been documented in several studies within the impact on the volatility of pricing oil on the business cycle. The commodity prices are involved in the same perspective regarding the demand. Within the expansion phase, the competition for commodities product such as the gold and the energy tend to increase their prices comparing to the manufacturing goods, the introduction of the innovation as imitation reduces the opportunities investment to obtain economic rent, decreasing the demand for commodities. The boom in the commodities prices have an increase effect in the short run on the real GDP by raising the value and production and lifting the demand for ancillary goods and services. An increase in the investment in resource sector, such as metal or energy, may raise the potential output, which in turn boost the financial resource for the investment at the other sector, (IMF, 2017). Corden (1984) , the positive term trade and income shock associated with commodity boom shift production out of non-commodity tradable and into the non-tradable service sectors with lower productivity. The global economic crisis starting from 2012 was the result of the boom in the commodity prices characterized by unprecedented magnitude and duration, as the price reached the highest level in the history, this phase was characterized as a phase of mineral boom. Gold is a traded asset globally as alternative investment class to the ordinary portfolio comprising stocks and bonds.

Baur and McDermott (2010) argue that gold is a stabilizing factor for the financial system since it minimizes losses for market participants and portfolio managers in the event of negative market shocks. Apergis and Eleftheriou (2016) found that the business cycle asymmetrically affects gold returns, while these returns respond stronger during the recessionary than booming phases of the cycle. Within the last decade, after the oil shocks petroleum crisis, the constraint of adjustment within the capital market have probably less influenced on the size and level of stocks trading which for some countries targeted their policies for the optimum arrangements for their portfolios. For the policy economic makers, they have to take their decisions on the volume and pricing of oil with the desired level of oil revenues and their use (consumer goods, investment goods, and financial investments). Schumpeter is among the economists who reject the frame that the decline in prices might be a result of slow-down in terms of output and growth, as he explains that within the great recession (1878-1896) for the case of the falling of price due to a decline in the production of gold which result in profit squeeze and the decrease of the investment. At the same perspective as Schumpeter, for the economic phase of the commodities and the manufactured good on the business cycle, we find Prebisch (1950), Singer (1950), as well as Ocampo (1986) and Ocampo and Parra (2003) as prominent literature studying the commodities prices and the business cycles. It is basic on that we are referring to sorting out this dilemma of the cyclicity of inflation within the context of dollarization system. Within this paper we are looking to examine how it can be indexed the inflation for the pricing of oil and gold within dollarization system in order to make it in the sustainable level. The international co-movement of inflation can be caused by global prices for commodities, a global business cycle, a high importance of the US dollar, Ciccarelli & Mojon, (2010). Therefore, 'global inflation' is determined as a common factor from dynamics of domestic inflation process in different countries, (Kiselev and Zhivaykina, 2020). Using the RBC methodology, this paper aims at providing a framework to study the interlink of the energy , the gold and the stock market on the global inflation in order to bring a sustainable level of inflation in a dollarization era.

The Model

Within this section, we consider the model of RBC (Real Business Cycle) as an extension of the Hansen's (1985) indivisible labor economy, Kim and Loungani (1992) by introducing energy shocks, and Mackowiak and Wiederholt (2023) for the setting up of the assumptions of the model. The production function is CES and exhibits constant returns to scale in the variable factors, capital and labor.

$$Y_{it} = {L_t}^{\theta} A_t \left[(1-a-b){K_t}^{-v} + aP_e^{-v} + bP_g^{-v}\right]^{-\frac{(1-\theta)}{v}} \quad (1)$$

Y_t is the output of the economy in the period t, K_t is capital input, A_t is the stockastic technology shock common to all the economy. Production is assumed to use the energy e and the monetary system as connection between the real sphere and the financial sphere is using the gold as fiat money between both sphere. v is equal to $(1-s)/s$, s is the elasticity of substitution between the capital gold and energy. Labor's distributive share is given by the parameter θ.

The stock of capital accumulation according to the law of motion is:

$$K_t - K_{t-1} = I_t - \delta K_{t-1} \iff K_t = I_t + (1-\delta)K_{t-1}$$

Where $0 < \delta < 1$ is the depreciation rate and I_t is the investment at the period t. the economy's ressources constraint for period t is given by:

$Y_t = C_t + I_t + P_{e,t} + P_{g,t}$ **Where C_t is the consumption of the economy for the period t.**

The stockastic shock according to the law of motion is given by the following assumption:

$$A_t = \alpha_0 + \alpha_1 A_{t-1} + \varepsilon_t$$

ε are i.i.d with standard deviation σ.

The relative price of energy used in the economy, P_e, is given exogenously and follow the process:

$P_{e,t} = \gamma_{e,0} + \gamma_{e,1} P_{e,t-1} + \phi_{e,t} + \eta_e \phi_{e,t-1}$ **with an error variance of σ_e.**

The relative price of gold used in the economy, P_g, is given exogenously and follow the process:

$P_{g,t} = \gamma_{g,0} + \gamma_{g,1} P_{g,t-1} + \phi_{g,t} + \eta_g \phi_{g,t-1}$ **with an error variance of σ_g.**

Households in the economy are indefinitely lived and have preferences defined over consumption and leisure. Each household's endowment of time is normalised to 1 so that leisure is equal to $1 - L$. With reference to the standards RBC model within the divisible economy all variation in aggregate hours come from changes in the hours worked per household, within this assumption the utility function in the period t is given by:

$$U(c, L) = \log c + A \log(1 - L)$$

Within the steady state conditions, the first order conditions for firm's profit maximization imply that the order conditions for firm profit maximization imply that the marginal products of the three inputs are set equal to their respective prices:

$$Y_K = (1-a-b)(1-\theta)\,Y/\left[(1-a-b)K_t^{-v} + aP_e^{-v} + bP_g^{-v}\right]K_t^{-v-1} = r+\delta$$

$$Y_e = a(1-\theta)\,Y/\left[(1-a-b)K_t^{-v} + aP_e^{-v} + bP_g^{-v}\right]P_e^{-v-1} = P_e$$

$$Y_g = b(1-\theta)\,Y/\left[(1-a-b)K_t^{-v} + aP_e^{-v} + bP_g^{-v}\right]P_g^{-v-1} = P_g$$

$$Y_L = \theta\,Y/L = w$$

The first order condition for the household utility maximization gives:

$$\frac{C}{w} = (1-L)/A$$

In the steady state condition there are no net investment:

$$C = Y - \delta K - P_e - P_g$$

Baseline Model

Model Specification

Results

Conclusion

References