Exchange Rate Pass Through Inflation in Thailand

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Abstract

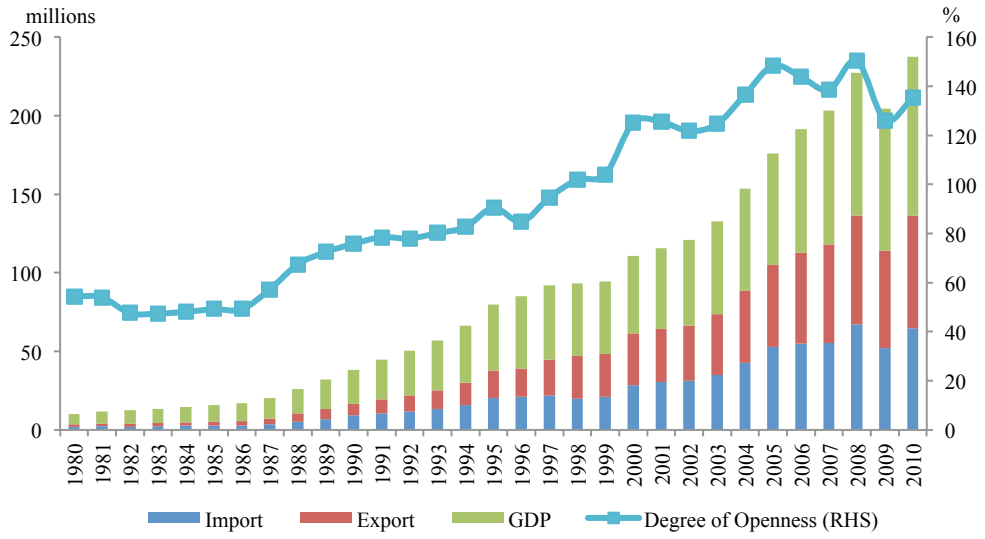
Price stability is essential for the prosperity of one economy. Moderate inflation is acceptable for the sustainable economic growth. Thailand as an export-oriented country considers exchange rate a crucial factor determining how well the economy proceeds. These two variables are in relation. Degree of pass through and short-run exchange rate adjustment toward long-run equilibrium will be examined to verify what monetary authority should do during these years of economic turbulence.

1. Introduction

1.1. Importance of the Study

Thailand nowadays has degree of openness for more than one hundred percent (Figure 1). The international transactions, therefore, are in focus. The value of accepted medium of exchange in the world community seems to get full of interest. Exchange rates of Thai Baht to other currencies are now examined and become so much important to the Thai economy due to the high degree of openness. Export plays a crucial role to determine how Thai economy will proceed.

Figure 1: Export, Import, GDP and degree of openness at current price



Source: NESDB

In the past, exchange rate was fixed at certain level to maintain the stability and mitigate the currency risk for the exporters and importers. Central bank intervention was unavoidable at that time to achieve such regime. In 1963, baht was kept at 20.8 to one dollar (Figure 2). After that, exchange rate regimes changed accordingly to the macroeconomic performance. Multiple exchange rate system was launched to tackle the run-out-of-dollar situation after the World War II before abandoning it once things got better with less speculation. Then, basket of currencies was implemented in order

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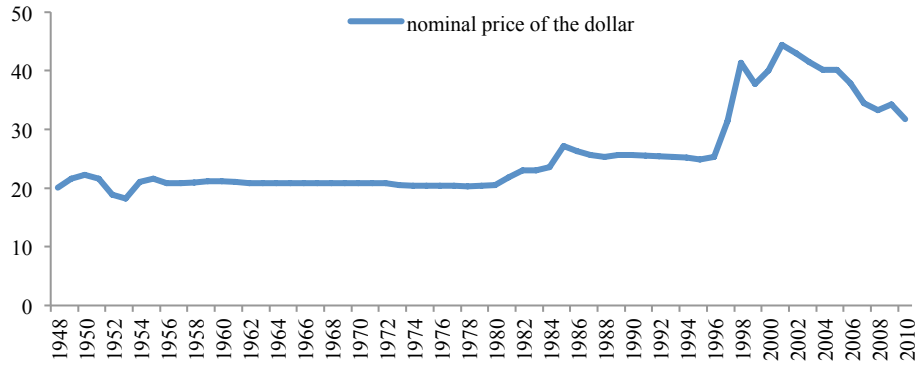
to give more flexibility to the currency. Still, Bank of Thailand was not aware of the upcoming tidal wave that would make the entire economy go into the recession.

Before 1997, everything was going well. Thailand enjoyed almost double-digit growth rate for a decade. No one would think one day such a miracle of Asia will collapse. The revision of exchange rate system became a must. Managed-float exchange rate regime was adopted after the 1997 crisis as the Bank of Thailand has learned from their mistakes. Thus, Thai currency now moves freely under the inspection of the central bank.

Figure 2: Nominal Exchange rate of Thai currency (baht/dollar)



Source: International Financial Statistics

Internal stability is also another aspect monetary authority considers. Change in Price level in one economy affects the poor more than the rich. Just a slight increase in necessary goods makes the poor adjust themselves, but maybe not for the rich. Furthermore, an increase in inflation might discourage investors to invest. Consumption will, as well, be affected. Inflation can also reduce comparative advantage of one country as it can be exported to consumers in any other countries, then they will perceive the higher price of goods, a decline in export will be inevitable. Animal's spirit can be hurt if instability and uncertainty exist for a certain period of time.

Price of food and oil also went skyrocketing in recent years. Alternative energy from agricultural products may be the cause of agriflation. A substitution of food to fuel might lead to another food crisis in the coming years. A challenge is for the government to keep monitoring and find a set of policies to encounter the change in the economic landscape of the world market.

Figure 3 illustrates how the exchange rate can explain inflation. A change in exchange rate leads to two possible ways to the change in price level in the country. First is that a direct increase in imported goods raises the overall consumer price level. Secondly, the imported intermediate inputs will be impacted. Cost of production for those factories that import inputs from abroad will increase, both from the intermediate inputs and the higher wage rate requested by the labor union. Figure 4 shows the overall price level and the import one, which the latter fluctuates and somehow signal the change to the consumer price index.

The process that the change in exchange rate contributes to the change in inflation is called pass-through. Complete pass-through happens when the total adjustment in exchange rate causes the same magnitude of change to consumer price

index. Incomplete pass-through should be observed these days as many restrictions come out in both exchange rate and product market of one economy. Nevertheless, if the exchange rate does not cause any changes to the inflation, no pass through is for such circumstance.

Figure 3: Mechanism from Exchange Rate to Inflation

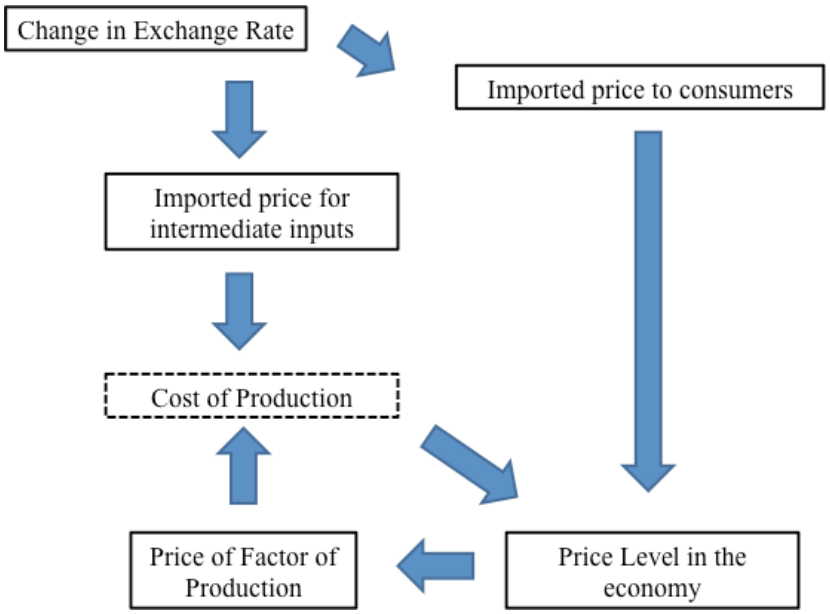
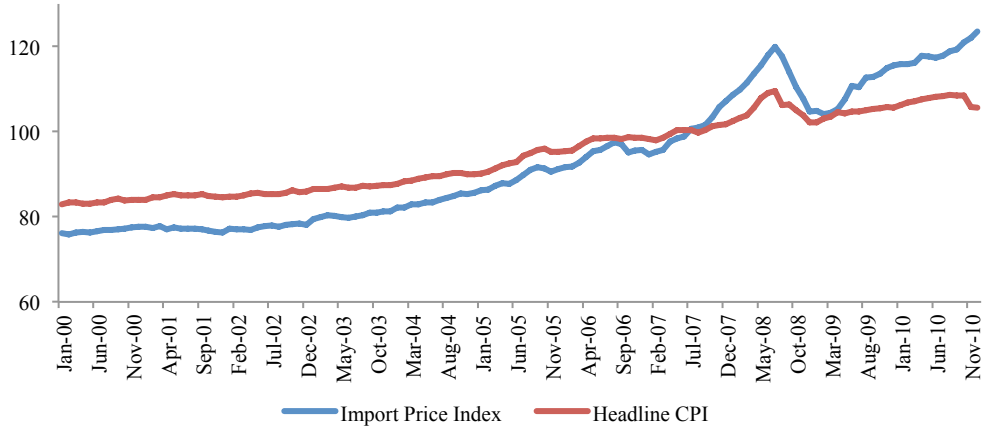


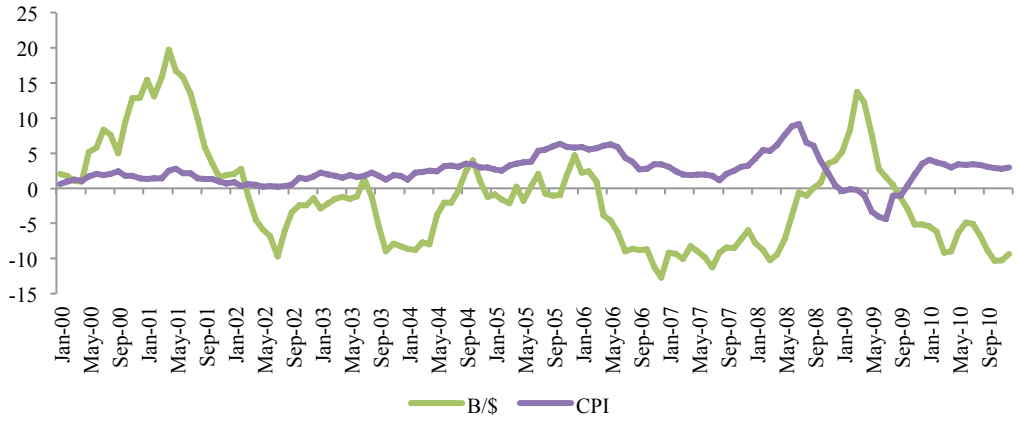
Figure 4: Change in Consumer Price Index and Import Price Index



Source: Bureau of Trade and Economic Indices

Figure 5 shows the movement of nominal exchange rate from baht to dollar in comparison with the consumer price index from 2000 to 2010 in order to avoid the abnormal years during the crisis. The exchange rate expresses more volatile pattern. Bank of Thailand also adopted inflation targeting policy to curb inflationary pressure. The stability of the economy has been monitored.

Figure 5: Change in Exchange Rate and Consumer Price Index (% yoy)



Source: Bank of Thailand and Bureau of Trade and Economic Indices

1.2. Objectives

The objectives of this research paper are listed as following:

- To describe the behavior of consumer price index and exchange rate in the specific period
- To explain the relationship between inflation and exchange rate after the crisis
- To investigate the degree of exchange rate pass-through inflation in Thailand

1.3. Scope of Study

Thailand will be used as the case study. In order to avoid structural break in 1997, exchange rate, baht to dollar, will be obtained from period 2000 to May, 2011. Dubai oil price will be collected. Import price will also be added in the model to test for the degree of pass through. Consumer Production Index (CPI) will be elaborated as the price level.

1.4. Data Requirement

Data from January, 2000 to May, 2011 will be used as during this period the Thai economy has stabilized itself after the financial slump in 1997. Main source of data will be taken from the Bank of Thailand for the nominal exchange rate. Reuter is a good source to obtain price of Dubai oil during the interested period. Office of National Economic and Social Development Board (NESDB) will also be another good resource of information as well as the Bureau of Trade and Economic Indices, Ministry of Commerce for indices.

1.5. Report Outline

This paper will first outline the situation of the price level and exchange rate in Thailand since 2000 until 2010 in part 2. Section 3 will provide the theoretical framework and literature review about the economic models that will be used to analyze the impact of the change in exchange rate to inflation. We will apply the models to test the relationship between these two variables in section 4. Policy implication will be presented in section 5. Next, limitation of the study and the future research will be provided and the conclusion will be drawn in section 7.

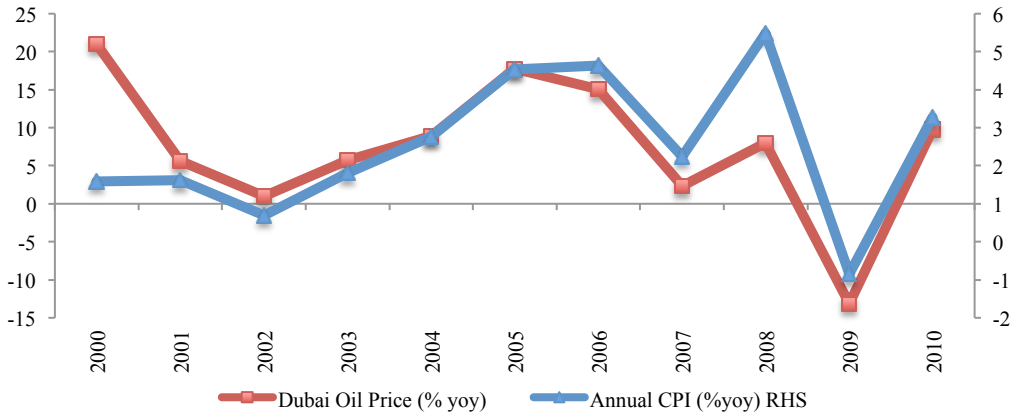
2. Inflation in Thailand

Thailand has gone through many stages of development, after the hyperinflation in the World War 2 period, monetary authority successfully stabilized the economic environment. Bank of Thailand accompanied with the Ministry of Finance and Ministry of Commerce plays important roles to shape the way price level in Thailand adjusted. External shock from oil price also takes its part to determine the inflation. Cost of production has more or less the positive relationship with the price of product sold in Thailand. Consumer price index can be served as an indicator to illustrate how much inflation one economy has.

2.1. Inflation in Thailand from 2000 to 2010

Thailand is an oil dependent country so the price of oil must have some clues to the change in the overall price level (Figure **6**). In 2000, world crude oil price increased as OPEC reduced their production. As a result, several public transportation costs had risen. Bus fare between Bangkok and some provinces increased and also other fares increases included motorcycle taxi fare and passenger ferries fare. Still inflation was moderate in 2000 since it was offset by the decline in food and beverage price.

Figure 6: Change in CPI and Dubai Oil Price



Source: Bureau of Trade and Economic Indices and Bank of Thailand

Upward adjustment in the electricity Ft rate (the rate computed from costs of distribution, marketing and consumer services) for February-May 2001 to 0.24 baht per unit raised the overall electricity charges by 11 per cent, pushing more or less

people cost of living. The hike in excise tax rate was on alcoholic beverages and tobacco at the end of March 2001.

The 911 event adversely affected Thai economy. Oil prices immediately rose after the terrorist attacks due to the psychological effect that led to stock piling for emergency purposes. Later, Oil prices adjusted downward as the military tension did not spread to the main oil production sites in the Middle East. Oil demand also continued to soften in accordance with worsening world economic conditions. A decline in oil price also indicated the failure of oil-exporting countries, both within and outside OPEC, to settle production limits. In addition, the war in Afghanistan did not exert upward pressure on the price of crude oil. The reduction in world oil prices led to a decline in the domestic retail price of oil. Consequently, the price level in 2001 remained acceptable.

The fluctuation of oil price in 2002 was inevitable as the tension between Iraq and the US was heightened around the end of the year even though it slowed down in the first half of the year. Overall inflation was moderate.

The increase in the Euro bus fare by 2 baht at every distance segment and train charges increased by 20 baht across the board were effective from 16 January 2003 and October 2003 respectively. Unfavorable conditions of weather drove down the agricultural output, increasing the price level of food and beverage. Furthermore, war between Iraq and US and under-expected oil production in Iraq took parts in the hike of inflation in 2003.

An increase in the rice price was realized in 2004, as rice output in major production sources, particularly in China, were deteriorated by natural disasters. Therefore, world rice output and stock remained low. Moreover, the rise in pork price was higher than the decline in chicken price during the avian flu outbreak. Reductions in the excise tax on vehicles and the vehicle insurance premium in July 2004 as well as continuous price administration on some products kept inflation low. Domestic retail benzene prices remained high, although declining continuously following the fall in the Dubai crude oil price. Thus, a rise in inflation in 2004 was recognized, a slight increase compared to that last year.

Food prices in 2005 accelerated as a result of higher vegetable and fruit prices as demand outpaced supply following the draught, and a rise in the prices of eggs and dairy products as a consequence of the avian flu outbreak at that time. In particular, prices of vegetables and fruits rose sharply following the flood as supply fell short of demand, and prices of meat and poultry rose due to the third outbreak of avian flu that led to reduced supply. The prices of passenger cars declined following a reduction in the excise tax rate and vehicle insurance premium in July 2004. The slight downward trend in world crude oil prices from the peak in 2005 Q3 (Dubai oil prices reached a high of 59.18 dollars per barrel) led to lower domestic retail benzene and diesel oil prices. Throughout the year, a rise in price level was comprehended.

Inflation did not accelerate as decelerating raw food price in 2006 Q1 counterbalanced rising energy inflation. The Ministry of Commerce had already consented to the price increases of several items on the watchlist. Flood damaged in various provinces during 2006, which brought about a rise in the prices of raw food, especially those of fruits and vegetables. Nevertheless, the rise in raw food prices should prove to be only temporary. As flood effects subsided at the end of 2006, raw food prices would soon return to its normal trend.

The deceleration in inflation was in line with lower domestic retail prices of oil and electricity and the deceleration in raw food prices from softening effects of flood in early 2007. Oil price went up in 2007Q2 due to the supply-side factors. Such

factors included maintenance shutdowns of a number of US oil refineries, which held down US oil reserves, and production uncertainty following strikes undertaken by labor unions in Nigeria, a major oil producer. Demand side also played its role. Among the most important contributors were high demands for gasoline in the US during the tourist season, a reduction in world crude oil inventories and concerns regarding the effect of hurricanes in the Gulf of Mexico on US oil pipelines. The average price of Dubai crude oil, which rose to 82.83 US dollars per barrel in 2007 Q4 since higher global oil demand, especially from China and India, which grew at a rate at which supply expansion could not manage to keep pace. Some of the factors constraining oil supply expansion during this quarter were the maintenance shutdowns of a number of oil refineries, natural disasters that lowered production along with domestic political factors within the oil producing countries in the Middle East as well as in Africa; and lower confidence in the US economy and the weakening of the US dollar, which caused investors to increasingly diversify their holdings of financial assets into commodities such as oil and gold, which translated into higher speculative activities in the futures market for oil. Nevertheless, the pressure on headline inflation was partially eased with the slowdown in raw food price increased, as vegetables and fruits production benefited from desirable weather conditions. All in all, inflation in 2007 was around 2.24 percent.

In 2008, the continuous rise in oil prices in recent periods resulted from a combination of structural factors from both the demand and supply sides. Furthermore, oil prices were also affected by temporary supply factors, namely the longer- and colder-than-usual winter in the US that resulted in a larger-than-normal increase in the demand for energy. These intensified pressures led the government to approve a six-month subsidy of diesel prices of up to 0.9 baht per liter, in order to relieve the impact on the manufacturing and transportation sectors, as well as consumers. Moreover, agricultural production in other countries was hindered by unfavorable climates, such as in the case of Vietnam, thus further pushing up rice and meat prices. The simultaneous and correlated rise of oil and agricultural prices resulted in a significant increase in businesses' cost of production. Nevertheless, amidst these upward pressures on prices, authorities tightened their price administration efforts. This was expected to help relieve some of the impact on the cost of living in the short run, and through its psychological effects should help contain inflation expectations from rising significantly. Still in 2008 Q4, global oil prices continued to decline from the previous quarter, with the price of Dubai oil falling considerably from an average of 113.62 US dollars per barrel in 2008 Q3 to 52.8 US dollars per barrel in this quarter. The drop in oil prices resulted from the decline in global oil demand following the economic slowdown in major industrialized countries. Furthermore, OPEC's announcements to reduce oil production by 3.7 million barrels in this quarter were unsuccessful at pushing up oil price. Overall, the hike of oil price marked a rise in inflation for 2008. Government's cost-of-living reduction measures were also imposed to fight the global financial crises.

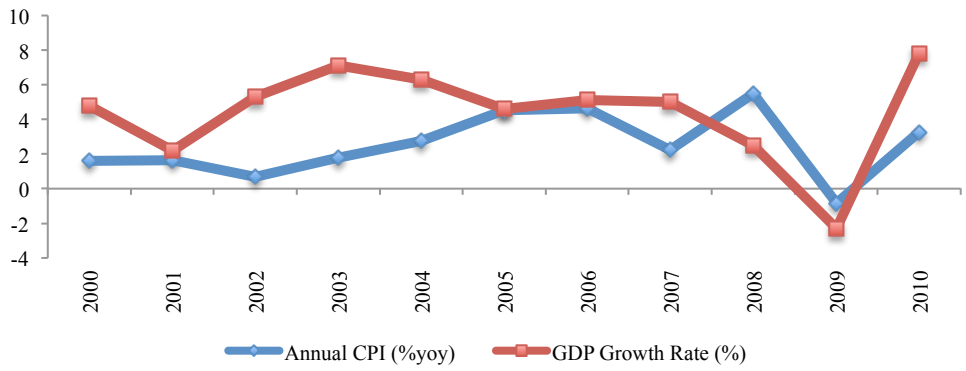
Low inflation in 2009 was mainly owing to relatively low domestic retail oil prices compared to the same period last year and measures implemented by the government to alleviate the public's cost of living and the 15-year free education program. The 15-year free education program, effective since May 2009, caused the prices of education related goods and services to decline significantly.

In recent year, raw food prices increased as the severe hot weather caused the supply of vegetables, fruits as well as meats to decrease, and also energy prices rise, as domestic retail oil prices increased from the same period last year when the global

financial crisis was still unresolved. In 2010Q4, Oil prices accelerated as a result of an increase in domestic retail oil prices following the uptrend in world prices. Such development was in line with continued global economic recovery and unexpected cold weather in the US and Europe. Nevertheless, price pressure from both the supply and demand sides was expected to edge higher as a result of rising input prices along with world commodity prices; higher wages and salaries; greater pass-through of costs to prices due to lower ability of firms to absorb costs, given that they had been cooperating with the authorities in holding off price increases throughout 2010; and higher demand-pulled pressure following continued economic expansion.

For the relationship between inflation and economic growth, Thai economy just came back from its recession in 2000. Inflation was modest around 2 percent for years (Figure 7) before it picked up around 2005 due to the heating-up economy. Global financial crisis hinders the economic prosperity of Thai economy as Thai growth strategy depended so much on international trade and that drove down both inflation and GDP growth. 2010 marked the higher inflation year, as the economy was resilient after the economic slump. Inflation also moves in the same direction as the GDP growth rate

Figure 7: CPI change and GDP growth rate



Source: Bureau of Trade and Economic Indices and Bank of Thailand

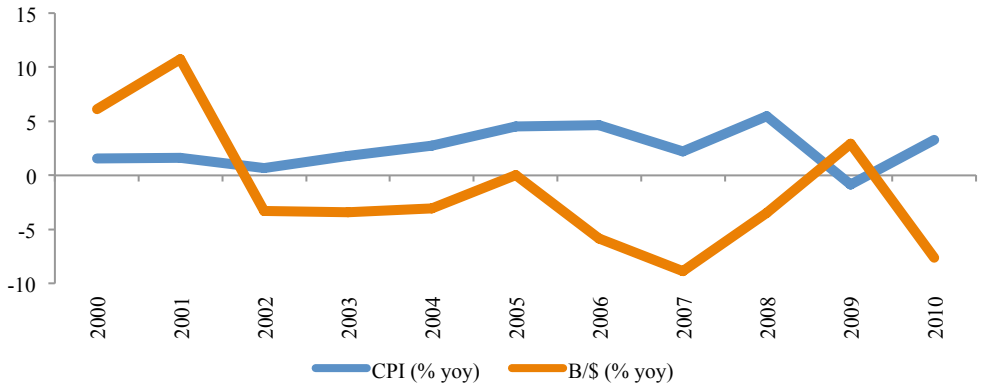
Exchange rate might affect inflation in any country. Thailand depends so much on international market. Thus, the change in price of goods and services the rest of the world buy must have an impact on the inflation in Thailand; the process is illustrated in Figure 3.

Exchange rate, baht to dollar, is now important to Thai economy. Bath has appreciated since 2001 as Thai economy made its comeback from 1997 crisis. It depreciated just a little in 2009 and appreciated again in 2010 as the US economy was still fragile even though the state government had provided the stimulus packages and also went through a couple of quantitative easing after the US toxic-asset crisis. This change in relationship of exchange rate and inflation might come from the fragility of dollar and make its value less and less and that put the pressure in the exchange rate, along with the economic slump in the year 2008 which resulted in the decline in price level and after that, inflation climbs up as a consequence of stimulus packages from the government.

Figure 8 shows the relationship between inflation and change in exchange rate, positively. In 2001, although Thai baht appreciated, inflation remained stable at that time. However, the sequent appreciation of bath came with a rise in inflation. In 2009, the depreciation of baht just showed the negative relationship with the change in CPI.

In 2010, baht appreciated and inflation started rising. This change in relationship of exchange rate and inflation might come from the fragility of dollar and make its value less and less and that put the pressure in the exchange rate, along with the economic slump in the year 2008 which resulted in the decline in price level and after that, inflation climbs up as a consequent of stimulus packages from the government.

Figure 8: CPI change and Exchange Rate



Source: Bureau of Trade and Economic Indices and Bank of Thailand

2.2. Government Price Administration

Bank of Thailand as a monetary authority with the aims toward price stability of the economy always takes part in the control of inflation. Inflation targeting monetary policy has been implemented since May 2000. From May 2000 to Dec 2008, core inflation was set to be met between 0 – 3.5 per cent. BOT believed that these figures would be enough to provide sufficient flexibility for economic growth. In 2009, the monetary policy committee and ministry of commerce have carefully considered for the suitability of Thai economy. The agreement was reached its conclusion that the inflation target range changes to be around 0.5 – 3 per cent, approved by the cabinet on Sep 1, 2009. Authorities think that low and stable inflation will ensure the sustainability of Thai economy. This range will make Thai inflation comparable to trading partners' and competitors' inflation, which help maintain export competitiveness. Confidence of consumers and business enterprise will also be guaranteed. Bank of Thailand will set their policy rate to signal the market and that will affect price level.

Apart from Bank of Thailand monetary policy for price stability, government interventions have been employed for the well-being of their citizen. Energy price is also another factor affecting cost of living the most.

Oil fund has been found since 1979 due to the energy crisis at that time. Oil price subsidy by Energy Policy and Planning Committee is always used to mitigate the pressure on people cost of living. Once oil prices climbed up to certain level that will exacerbate people living condition, this oil fund will come in and subsidize the price. Still, if the price was low, at that time, oil fund will collect money up to certain percent so that it has reserve to lower the price once it is at its hike.

Not only that, The government has regulated and supervised the prices of consumer goods and services necessary for daily life, such as cooking oil, medicines, milk, rice, detergent, toothpaste, and fertilizer, so that they are fairly priced and appropriately reflect the production costs. Ministry of Commerce also established a

watch list and asked that the prices of goods and services in the watch list be kept fixed and need the government's consent before being raised to alleviate the burden on other producers and consumers.

Global financial crisis in 2008 exerted Thai government to take action in several aspects. Stimulus packages were launched to encounter the global recession and raise employment rate. Government's cost-of-living support program was then carried out. 6 relief measures were in line for 6 months as following;

1. Reduction of excise charges for gasohol and diesel
2. Suspend price adjustment for cooking gas for household use.
3. Reduction of water charges.
4. Reduction of electricity charges.
5. Commuters of non-air-conditioned buses in Bangkok will avail themselves to free services. Of 1,600 buses, half will offer free rides for commuters
6. All third-class train services in every route nationwide will not charge passengers.

After such measure ended, the next cabinet came in and extended 5 measures of them and that kept price level in Thailand for months.

3. Literature Review and Methodology

3.1. Literature Review

Many tools have been used to study this economic phenomenon. This section is going to revise what researchers have done so far on this pass through issue so that some of their stock of knowledge can be applied, as new set of data is now available.

Dornbusch (1987) applied industrial organization combined with purchasing power parity to explain the relationship between exchange rate and inflation and found that price level adjust slowly in accordance with the change in exchange rate. After that Hopper and Mann (1989) investigated the impact of exchange rate in 1980s of the import price, especially the industrial goods. Mark up model was carried out, which the price of goods and services in the country is determined by the price of the last unit of imported intermediate inputs. The study discovered the 50 to 60 percent of pass through, making firms profit more as they can set higher price due to the depreciation of the exchange rate. Dwyer, Kent and Pease (1993) employed error correction model and found that in short run, there was a little magnitude from exchange rate to inflation. Nonetheless, it took two months in the long run to affect the inflation.

Wickremasinghe and Silvapulle (2004) explored Japanese imported goods. Cointegration and asymmetric model was tested to find the degree of pass through. It was around 0.674 to 1.202 in the paper. Campa and Goldberg (2002) also had an empirical study on 19 countries that are in Organization for Economic Cooperation and Development (OECD). Panel data was employed. Incomplete pass through was observed. Korthonen and Wachtel (2005) started the study with Commonwealth of Independent States (CIS), independent from the Soviet Union. Vector Autoregression was carried out with impulse function and variance decomposition and discover that the degree of pass through and the magnitude of volatility of the exchange rate to inflation are related. Kiptui, Ndolo and Kaminchia (2005) used Kenya as a case study. They first had cointegration test by Johansen and the first stage pass through was found by error correction model. Impulse response was imposed for the second stage.

Chai-anant, et al (2008) examined the impact of exchange rate as a transmission mechanism to mitigate the inflationary pressure caused by the monetary policy under inflation targeting. They construct a small structure model of the economy. The model postulates the relationship among macroeconomic variables within a simple and tractable framework. An element of dynamic stochastic general equilibrium (DSGE) with rational expectation was also added to examine the role of the exchange rate. The model suggests that the response of exchange rate to excessive inflation provides relatively low inflation volatility compared to the baseline. Still the policy implication is concluded from the small model. Certain limitations of such model should also be taken into account, as it cannot capture all the dynamics nature of the real economy.

Mishkin (2008) provided what recent researches have done so far about exchange rate pass through and present the microeconomic evidence. He imposed simulation of SIGMA model, described by Erceg, Guerrieri and Gust (2006) with some adjustments allowing the incomplete pass-through. As the paper indicated, sizable depreciation of nominal exchange rate created just a small change in price level in industrialized countries and these effects decline in the past decades. Weak pass-through of the exchange rate to import price had been realized. However, exchange rate volatility can still affect on inflation and economic activities. Thus, monetary authorities still need to consider and take care of exchange rate pass through inflation.

Barhoumi and Jouini (2008) used both Taylor proposition to examine the pass-through for some developing countries and also employ structural breaks and cointegration tests by Bai and Perrson (1998), and Gregory and Hansen (1996), examining the coefficients of pass-through. Data quarterly from 1980 to 2003 were applied. Imperfect competitive market structure is assumed, concentrating on the micro-foundation of firms' pricing and regard exchange rate pass-through as an equilibrium profit maximizing strategies for firms. They found that there was a decline in pass-through between exchange rate and import price. This can be explained by a shift of monetary policy regime of many central banks in developing countries.

3.2. Methodology

The methodology for this paper will adopt Purchasing Power Parity (PPP) as a platform. Testing validity of PPP will be in hand (Chai-anant, et al 2008). The model will be similar to that suggested in Hooper and Mann (1989) and Campa and Goldberg (2002). Exchange rates are supposed to be transmitted to consumer price index via import price, but not directly affected.

Consumer price index will be set as a variable of interest. Dubai oil price index is one of the main factors to illustrate the external shocks to Thai economy. Manufacturing Production Index (MPI) will be added in the model to be explanatory variables to indicate supply and demand conditions. Exchange rate will also be in the model to be the main actor of this finding. Import price in term of dollar will be a proxy to cost to imported raw materials. All variables are in natural logarithm form, which are collected monthly. The model is presented as following:

$$P_t = \beta_0 + \beta_1 e_t + \beta_2 mpi_t + \beta_3 oil_t + \beta_4 PM_t \quad (1)$$

where β_i = cointegrating factors,

P_t = consumer price index,

oil_t= the Dubai oil price index,

PM_t = the import price in term of dollar,

mpi_t = the manufacturing production index,

e_t = the exchange rate in the form of baht/dollar,

Equation (1) represents the long run relationship. Price level will depend on the exchange rate, which is in accordance with Purchasing Power Parity. Manufacturing production index will act like the GDP measuring how well the economy proceeds in that particular month and that will affect inflation. Oil price is as the supply shock to cost of production and import price index is for the price of goods purchased from the rest of the world.

The error correction model (ECM) will provide the short-run dynamics. This ECM will allow the data to indicate their own pattern in short run. If all these variables do not have spurious correlation, they will show their ways to correct themselves and achieve its long-run equilibrium. The coefficient of ΔECM_{t-i} will tell us how the price level reacts to the change in exchange rate in short run, which will result in reaching the long-run equilibrium. The model is presented below,

$$\Delta P_t = \alpha_0 + \alpha_1(ECM_{t-1}) + \sum_{i=1}^{p} \gamma_{1i}\, \Delta oil_{t-i} + \sum_{i=1}^{p} \gamma_{2i}\, \Delta PM_{t-i} + \sum_{i=1}^{p} \gamma_{3i}\, \Delta mpi_{t-i} + \sum_{i=1}^{p} \gamma_{4i}\, \Delta e_{t-i} \quad (2)$$

,where $ECM_t = P_t - \beta_0 - \beta_1 e_t - \beta_2 mpi_t - \beta_3 oil_t - \beta_4 PM_t$

Still, the scrutiny of these data needs to be done. Time series sometimes are not behaving in such a way that can be put in the model. Spurious regression, which a high value of R^2 is realized but no exact meaning can be extracted, should be monitored. Stationary and non stationary of each variable will be investigated by the unit root test with Dickey and Fuller way of calculation.

From first order autoregression or AR(1):

$$X_t = \rho X_{t-1} + u_t \quad (3)$$

where X_t = the interested variable that determined by itself from last period

ρ = the coefficient of X_{t-1}

u_t = the error term

Null and alternative hypotheses will be set and find whether the data is stationary or not. If ρ = 1 shows significant result, that set of data is non stationary and need to be adjusted before using them in the model.

Not only is the stationary characteristic what error correction model wants but also the cointegration of those variables.

$$Y_t = \alpha + \rho X_{t-1} + e_t \quad (4)$$

$$\Delta e_t = \gamma e_{t-1} + \sum_{i=1}^{k} \varphi_i \Delta e_{t-1} + e_t \quad (5)$$

Two sets of variables will have their long run equilibrium once, in this paper, two-step approach applied. The first one is to apply OLS to equation (4) and then e_t will be proceed through augmented Dickey-Fuller test with no time trend and constant, equation (5) to find the cointegration. With this, error correction model can be constructed and used to find the degree of pass-through.

4. Research Result

4.1. Unit Root Tests

Unit root tests are performed to justify all those variables can be applied in the error correction model. Results indicate that we cannot reject all null hypotheses (Table 1) and conclude that all variables are non stationary at .05 level of significance.

Table 1: Unit Root Tests on Variables

Variable	t-statistics	5% critical value	Result
CPI	0.27	-2.88	Non Stationary
Dubai	-1.18	-2.88	Non Stationary
Imported Price	0.38	-2.88	Non Stationary
MPI	-0.82	-2.88	Non Stationary
Exchange Rate (B/$)	-0.41	-2.88	Non Stationary

Note: The augmented Dickey-Fuller test is performed.The optimal lags for the test are selected by the Schwarz Information Criterion (SIC).

From Table 2, augmented Dickey-Fuller tests at first difference indicate that the absolute value of ADF statistics exceed those of critical value, meaning that they are stationary at 0.05 level of significance at first difference.

Table 2: Unit Root Tests on Variables at first difference

Variable at first difference	t-statistics	5% critical value	Result
CPI	-11.30	-2.88	Stationary
Dubai	-7.23	-2.88	Stationary
Imported Price	-5.18	-2.88	Stationary
MPI	-5.85	-2.88	Stationary
Exchange Rate (B/$)	-7.86	-2.88	Stationary

Note: The augmented Dickey-Fuller test is performed. The optimal lags for the test are selected by the Schwarz Information Criterion (SIC).

4.2. Cointegration test

From unit root tests, Consumer Price Index (CPI), Dubai oil price index (Oil), Imported Price in term of dollar (PMT), Manufacturing production index (MPI), and exchange rate (e) are stationary at first difference with can be tested for cointergrating relation.

$P_t = 1.6089 + 0.0821\ e_t + 0.0071 Oil_t + 0.0773\ MPI_t + 0.4899\ PM_t$ (6)
SE (0.1614)* (0.0230)* (0.0056) (0.0119)* (0.024)*

R-squared = 0.9878 D.W. = 0.4536
Adjusted R-squared = 0.9875

*Reject null hypothesis at 0.05 level of significance

Perform unit root test on residual to find whether it is stationary. The result is in Table **3**. It shows that the absolute value of ADF statistics is greater than that of critical value. Therefore, Consumer Price Index (CPI), Dubai oil price index (Oil), Imported Price in term of dollar (PMT), manufacturing production index (MPI), and exchange rate (e) have long-run relationship.

Table 3: Stationary test on residual at level

Variable	t-statistics	5% critical value	Result
Residual	-3.89	-2.88	Stationary

Note: The augmented Dickey-Fuller test is performed. The optimal lags for the test are selected by the Schwarz Information Criterion (SIC).

From (6), long-run equilibrium equation indicates that a change in exchange rate will result in 0.0821 change in inflation. An increase in oil price will also lead to 0.0071 rise in consumer price index. The incremental change in manufacturing production index will contribute to additional 0.0773 percent increase in price level. Lastly, 0.4899 increase in inflation is a consequence of one change in import price.

4.3. Error correction model

After all variables establish long-term equilibrium, error correction model is set with general to specific approach as following

$\Delta P_t = 0.0001 + 0.0072\ \Delta E_t + 0.0029 \Delta MPI_t + 0.0159\ \Delta OIL_t +$
SE (0.0005)* (0.0341) (0.0157) (0.0077)*

$0.2385 \Delta PM_t - 0.1813 ECM_{t-1}$ (7)
(0.0638)* (0.0491)*

R-squared = 0.3038 D.W. = 2.2921
Adjusted R-squared = 0.2770
*Reject null hypothesis at 0.05 level of significance

Equation (7) indicates short-run adjustment toward long-run equilibrium with the change in oil prices at the same period and others, manufacturing production index and imported price in term of dollar. No autocorrelation is specified in this model at 0.05 level of significance. Coefficient of adjustment is -0.1812, which means the error correction process will take place from the actual value to the long-run equilibrium by 0.1812 in each period or each month).

5. Policy Implication

The increase in price level since 2000 has been associated with the change in exchange rate. The depreciation and appreciation of Thai baht will have certain impact to inflation in Thailand. Jitpokkasame (2007) applied quarterly data from 1995 to 2005 and found that there is 0.18 percent of pass through from exchange rate to inflation while Chai-anant et al. (2008) found that there is 0.13 of pass through for the Thai economy, monthly data employed. This study reveals that 0.0821 of incomplete pass through from exchange rate to inflation. This paper can also conclude that over time, lower degree of pass through is identified because this study uses data from January 2000 to May, 2011 while Chai-anant et al. (2008) applied data from January, 2000 to June 2008.

The lower degree of pass through can be explained by more regulations from the authorities to the price level. Price administration from the Ministry of Commerce, inflation targeting policy, oil price subsidy and certain policies in the crisis years are attributed for the lower price level and also lower degree of pass through since those restrictions intervene the normal price adjustment. Moreover, domestic and world price competitions, which result in the rigidities in price level, are also another factor.

With less transmission between exchange rate and inflation, currency flexibility will be realized since the change in exchange rate will not be passing through domestic price level that much. So more rooms are for central bank to curb with external balances without hurting the price stability.

Nevertheless, Bank of Thailand still needs to keep their eyes on both currency management and inflation. The volatility of exchange has to be carefully inspected so that imported prices do not fluctuate and result in the variation in domestic price level. Firms importing those raw materials will benefit and can be at ease for the international transaction, which helps reduce the fluctuation in cost of production as well as the price of products sold in the market.

6. Limitation of the Study and Future Research

This research can also be extended to investigate in detail on each category of goods and services. Other currencies can be added in the model to find their impacts to the price level in one economy. Singapore oil price should be put in since retail oil price set by PTT depends on Singapore refinery but due to the unavailability of time series data. Series of Dubai oil price index instead is plugged in. The insignificance of the Dubai oil price index in the regression analysis is also weakness of this paper.

7. Conclusion

Low inflation does help the economy. It can preserve the purchasing power of consumers and savers. Business enterprises can maintain price competitiveness in both domestic and international markets. The volatility of the real interest rate will be kept. Thai economy will be promoted with a good overall economic environment through reduced uncertainty, which would otherwise negatively affect private-sector consumption and investment planning and decision-making. High inflation also affects the lifestyle of low-income household more than that of the rich.

Baht has been appreciating since 2000. As Thai economy shows its resilience to its long-term growth path, other reasons also account for appreciation of Thai baht. One of that comes from the devaluation of American dollar because of the subprime

crisis and policy initiated by Federal Reserve to tackle such turbulence. The change in exchange rate inevitably affects inflation.

The model in this paper uses Dubai oil price as one of the explanatory variable for external shocks to the change in Consumer Price Index. Imported price in term of dollar are representatives for domestic cost. Manufacturing production index is to indicate the supply and demand condition of Thai economy. Exchange rate also involves in this study according to Purchasing Power Parity theory. The study finds that there is 0.0821 degree of pass through from exchange rate to inflation in the long run. If baht appreciates or depreciate by 1 per cent, price level will be adjusted by 0.1812 in the opposite direction in short run so that it can correct errors for all variables and achieve its long-run equilibrium.

This incomplete pass through may come from several policies from the government. Inflation targeting monetary policy might be one of the actors restraining the increase in inflation. Government price administration for necessary goods and services from the Ministry of Commerce also holds a rise in price level. Government subsidy in energy as well helps both firms and households for cost of production and cost of living. Moreover, some measures to encounter the global financial crisis are in the process to lower the living expenses.

8. Appendix

Unit root test on CPI at level

Null Hypothesis: CPI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.266690	0.9757
Test critical values:	1% level	-3.478911	
	5% level	-2.882748	
	10% level	-2.578158	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CPI)
Method: Least Squares
Date: 08/14/11 Time: 13:08
Sample (adjusted): 2000M02 2011M05
Included observations: 136 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI(-1)	0.001676	0.006286	0.266690	0.7901
C	-0.005423	0.028613	-0.189537	0.8500

R-squared	0.000530	Mean dependent var	0.002206
Adjusted R-squared	-0.006928	S.D. dependent var	0.006959
S.E. of regression	0.006983	Akaike info criterion	-7.075985
Sum squared resid	0.006535	Schwarz criterion	-7.033152
Log likelihood	483.1670	F-statistic	0.071123
Durbin-Watson stat	1.962040	Prob(F-statistic)	0.790118

Unit root test Exchange Rate at level

Null Hypothesis: EX has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.407061	0.9036
Test critical values:	1% level	-3.479281	
	5% level	-2.882910	
	10% level	-2.578244	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EX)
Method: Least Squares
Date: 08/14/11 Time: 13:10
Sample (adjusted): 2000M03 2011M05
Included observations: 135 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EX(-1)	-0.004286	0.010529	-0.407061	0.6846
D(EX(-1))	0.367709	0.082224	4.472013	0.0000
C	0.014535	0.038281	0.379694	0.7048

R-squared	0.132237	Mean dependent var	-0.001630
Adjusted R-squared	0.119090	S.D. dependent var	0.015220
S.E. of regression	0.014285	Akaike info criterion	-5.637221
Sum squared resid	0.026937	Schwarz criterion	-5.572660
Log likelihood	383.5124	F-statistic	10.05767
Durbin-Watson stat	1.932362	Prob(F-statistic)	0.000086

Unit root test on MPI at level

Null Hypothesis: MPI has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.823996	0.8087
Test critical values:	1% level	-3.480425	
	5% level	-2.883408	
	10% level	-2.578510	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MPI)
Method: Least Squares
Date: 08/14/11 Time: 13:14
Sample (adjusted): 2000M06 2011M05
Included observations: 132 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MPI(-1)	-0.009028	0.010957	-0.823996	0.4115
D(MPI(-1))	-0.222025	0.091590	-2.424110	0.0168
D(MPI(-2))	0.035088	0.091003	0.385571	0.7005
D(MPI(-3))	0.243772	0.091625	2.660540	0.0088
D(MPI(-4))	-0.226533	0.092269	-2.455131	0.0154
C	0.052218	0.055071	0.948197	0.3448

R-squared	0.197024	Mean dependent var	0.006061
Adjusted R-squared	0.165160	S.D. dependent var	0.033447
S.E. of regression	0.030561	Akaike info criterion	-4.093825
Sum squared resid	0.117677	Schwarz criterion	-3.962789
Log likelihood	276.1924	F-statistic	6.183270
Durbin-Watson stat	1.976594	Prob(F-statistic)	0.000037

Unit root test on Dubai Oil Price Index at level

Null Hypothesis: OIL has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.178508	0.6826
Test critical values:	1% level	-3.479281	
	5% level	-2.882910	
	10% level	-2.578244	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(OIL)
Method: Least Squares
Date: 08/14/11 Time: 13:15
Sample (adjusted): 2000M03 2011M05
Included observations: 135 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OIL(-1)	-0.015570	0.013212	-1.178508	0.2407
D(OIL(-1))	0.376114	0.081217	4.630990	0.0000
C	0.086537	0.068348	1.266118	0.2077

R-squared	0.142150	Mean dependent var	0.010444
Adjusted R-squared	0.129152	S.D. dependent var	0.086705
S.E. of regression	0.080912	Akaike info criterion	-2.168933
Sum squared resid	0.864175	Schwarz criterion	-2.104371
Log likelihood	149.4030	F-statistic	10.93651
Durbin-Watson stat	1.931935	Prob(F-statistic)	0.000040

Unit root test on Imported Price in term of dollar at level

Null Hypothesis: IM has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.380478	0.9815
Test critical values:	1% level	-3.479656	
	5% level	-2.883073	
	10% level	-2.578331	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IM)
Method: Least Squares
Date: 08/14/11 Time: 13:13
Sample (adjusted): 2000M04 2011M05
Included observations: 134 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IM(-1)	0.002008	0.005277	0.380478	0.7042
D(IM(-1))	0.277119	0.086416	3.206817	0.0017
D(IM(-2))	0.214159	0.086597	2.473045	0.0147
C	-0.007054	0.023842	-0.295876	0.7678

R-squared	0.173092	Mean dependent var	0.004030
Adjusted R-squared	0.154009	S.D. dependent var	0.010628
S.E. of regression	0.009776	Akaike info criterion	-6.388437
Sum squared resid	0.012423	Schwarz criterion	-6.301934
Log likelihood	432.0253	F-statistic	9.070702
Durbin-Watson stat	1.993882	Prob(F-statistic)	0.000017

Unit root test on CPI at first difference

Null Hypothesis: D(CPI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.29956	0.0000
Test critical values:	1% level	-3.479281	
	5% level	-2.882910	
	10% level	-2.578244	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CPI,2)
Method: Least Squares
Date: 08/14/11 Time: 13:10
Sample (adjusted): 2000M03 2011M05
Included observations: 135 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CPI(-1))	-0.979592	0.086693	-11.29956	0.0000
C	0.002177	0.000633	3.438346	0.0008

R-squared	0.489796	Mean dependent var	0.000000
Adjusted R-squared	0.485960	S.D. dependent var	0.009774
S.E. of regression	0.007007	Akaike info criterion	-7.069023
Sum squared resid	0.006531	Schwarz criterion	-7.025982
Log likelihood	479.1590	F-statistic	127.6800
Durbin-Watson stat	2.005191	Prob(F-statistic)	0.000000

Unit root test on Exchange rate at first difference

Null Hypothesis: D(EX) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.891793	0.0000
Test critical values:	1% level	-3.479281	
	5% level	-2.882910	
	10% level	-2.578244	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EX,2)
Method: Least Squares
Date: 08/14/11 Time: 13:11
Sample (adjusted): 2000M03 2011M05
Included observations: 135 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EX(-1))	-0.637856	0.080825	-7.891793	0.0000
C	-0.001039	0.001233	-0.843270	0.4006

R-squared	0.318928	Mean dependent var	-3.24E-18
Adjusted R-squared	0.313807	S.D. dependent var	0.017191
S.E. of regression	0.014240	Akaike info criterion	-5.650782
Sum squared resid	0.026970	Schwarz criterion	-5.607741
Log likelihood	383.4278	F-statistic	62.28040
Durbin-Watson stat	1.928361	Prob(F-statistic)	0.000000

Unit root test on MPI at first difference

Null Hypothesis: D(MPI) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.853620	0.0000
Test critical values:	1% level	-3.480425	
	5% level	-2.883408	
	10% level	-2.578510	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MPI,2)
Method: Least Squares
Date: 08/14/11 Time: 13:15
Sample (adjusted): 2000M06 2011M05
Included observations: 132 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MPI(-1))	-1.169183	0.199737	-5.853620	0.0000
D(MPI(-1),2)	-0.052930	0.181622	-0.291428	0.7712
D(MPI(-2),2)	-0.015748	0.147071	-0.107076	0.9149
D(MPI(-3),2)	0.228468	0.092123	2.480033	0.0144
C	0.006902	0.002868	2.406229	0.0176

R-squared	0.666548	Mean dependent var	0.000833
Adjusted R-squared	0.656046	S.D. dependent var	0.052043
S.E. of regression	0.030522	Akaike info criterion	-4.103602
Sum squared resid	0.118311	Schwarz criterion	-3.994405
Log likelihood	275.8378	F-statistic	63.46621
Durbin-Watson stat	1.982731	Prob(F-statistic)	0.000000

Unit root test on Dubai Oil Price at first difference

Null Hypothesis: D(OIL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.856553	0.0000
Test critical values:	1% level	-3.479281	
	5% level	-2.882910	
	10% level	-2.578244	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(OIL,2)
Method: Least Squares
Date: 08/14/11 Time: 13:16
Sample (adjusted): 2000M03 2011M05
Included observations: 135 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OIL(-1))	-0.634827	0.080802	-7.856553	0.0000
C	0.006414	0.007031	0.912277	0.3633

R-squared	0.316987	Mean dependent var	-0.000593
Adjusted R-squared	0.311852	S.D. dependent var	0.097680
S.E. of regression	0.081030	Akaike info criterion	-2.173281
Sum squared resid	0.873268	Schwarz criterion	-2.130240
Log likelihood	148.6965	F-statistic	61.72542
Durbin-Watson stat	1.921822	Prob(F-statistic)	0.000000

Unit root test on Imported Price in term of dollar at first difference

Null Hypothesis: D(IM) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.176504	0.0000
Test critical values:	1% level	-3.479656	
	5% level	-2.883073	
	10% level	-2.578331	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IM,2)
Method: Least Squares
Date: 08/14/11 Time: 13:12
Sample (adjusted): 2000M04 2011M05
Included observations: 134 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IM(-1))	-0.498832	0.096365	-5.176504	0.0000
D(IM(-1),2)	-0.219334	0.085243	-2.573046	0.0112
C	0.002010	0.000927	2.168538	0.0319

R-squared	0.352229	Mean dependent var	0.000000
Adjusted R-squared	0.342339	S.D. dependent var	0.012015
S.E. of regression	0.009744	Akaike info criterion	-6.402249
Sum squared resid	0.012437	Schwarz criterion	-6.337372
Log likelihood	431.9507	F-statistic	35.61596
Durbin-Watson stat	1.997107	Prob(F-statistic)	0.000000

Cointegration Test

Dependent Variable: CPI
Method: Least Squares
Date: 08/14/11 Time: 13:23
Sample (adjusted): 2000M01 2011M05
Included observations: 137 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EX	0.082054	0.023049	3.559974	0.0005
IM	0.489878	0.023916	20.48315	0.0000
MPI	0.077346	0.011891	6.504697	0.0000
OIL	0.007139	0.005576	1.280346	0.2027
C	1.608943	0.161411	9.968012	0.0000

R-squared	0.987847	Mean dependent var	4.552336
Adjusted R-squared	0.987479	S.D. dependent var	0.096355
S.E. of regression	0.010782	Akaike info criterion	-6.186087
Sum squared resid	0.015345	Schwarz criterion	-6.079518
Log likelihood	428.7469	F-statistic	2682.409
Durbin-Watson stat	0.448529	Prob(F-statistic)	0.000000

Error Correction Model

Dependent Variable: D(CPI)
Method: Least Squares
Date: 08/14/11 Time: 13:26
Sample (adjusted): 2000M02 2011M05
Included observations: 136 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001094	0.000554	1.973182	0.0506
D(EX)	0.007263	0.034174	0.212546	0.8320
D(IM)	0.238465	0.063782	3.738765	0.0003
D(MPI)	0.002901	0.015734	0.184385	0.8540
D(OIL)	0.015902	0.007730	2.057185	0.0417
RESIDUAL(-1)	-0.181255	0.049090	-3.692264	0.0003

R-squared	0.303815	Mean dependent var	0.002206
Adjusted R-squared	0.277039	S.D. dependent var	0.006959
S.E. of regression	0.005917	Akaike info criterion	-7.378770
Sum squared resid	0.004552	Schwarz criterion	-7.250271
Log likelihood	507.7564	F-statistic	11.34640
Durbin-Watson stat	2.358546	Prob(F-statistic)	0.000000

Residual

Null Hypothesis: RESIDUAL has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.890276	0.0028
Test critical values:	1% level	-3.478911	
	5% level	-2.882748	
	10% level	-2.578158	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESIDUAL)
Method: Least Squares
Date: 08/14/11 Time: 13:24
Sample (adjusted): 2000M02 2011M05
Included observations: 136 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESIDUAL(-1)	-0.216538	0.055661	-3.890276	0.0002
C	-0.000163	0.000582	-0.279305	0.7804

R-squared	0.101481	Mean dependent var	-0.000197
Adjusted R-squared	0.094775	S.D. dependent var	0.007137
S.E. of regression	0.006791	Akaike info criterion	-7.131896
Sum squared resid	0.006179	Schwarz criterion	-7.089062
Log likelihood	486.9689	F-statistic	15.13425
Durbin-Watson stat	2.234725	Prob(F-statistic)	0.000157

Serial Correlation LM Test for ECM

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.399968	Prob. F(2,128)	0.036416
Obs*R-squared	6.860474	Prob. Chi-Square(2)	0.032379

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 08/14/11 Time: 13:28
Sample: 2000M02 2011M05
Included observations: 136
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.73E-05	0.000547	-0.177991	0.8590
D(EX)	0.014248	0.034316	0.415199	0.6787
D(IM)	0.030034	0.064304	0.467060	0.6413
D(MPI)	-0.001809	0.015479	-0.116895	0.9071
D(OIL)	0.000211	0.007594	0.027739	0.9779
RESIDUAL(-1)	0.086584	0.065580	1.320272	0.1891
RESID(-1)	-0.285375	0.120003	-2.378062	0.0189
RESID(-2)	-0.015017	0.102057	-0.147139	0.8833

R-squared	0.050445	Mean dependent var	-4.46E-20
Adjusted R-squared	-0.001484	S.D. dependent var	0.005807
S.E. of regression	0.005811	Akaike info criterion	-7.401120
Sum squared resid	0.004322	Schwarz criterion	-7.229788
Log likelihood	511.2762	F-statistic	0.971420
Durbin-Watson stat	2.014173	Prob(F-statistic)	0.454981

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