IMPACT OF PALM OIL SUPPLY AND DEMAND ON CRUDE PALM OIL PRICE BEHAVIOUR

By:
Ayat K. Ab Rahman
Malaysian Palm Oil Board (MPOB)
To highlights the impact of price behaviour on Malaysian palm oil supply and demand.

To examine fundamental and market sentiment factors on CPO price behaviour in 2013.
INTRODUCTION

- Crude palm oil (CPO) price behaviour at this moment is more complex, thus creating high volatility in its prices.

- This is because palm oil is the largest vegetable oil traded in the world market, with a volume of 38.68 Mn T in 2011 & estimated rise to 43.50 Mn T in 2012.

- In 2012, CPO production from Indonesia and Malaysia amounted to 27.00 Mn T & 18.79 Mn T respectively.

- Total palm oil export volume by these two countries in 2012 amounted to 36.56 Mn T, with Indonesia at 19.00 Mn T and Malaysia at 17.56 Mn T.

- CPO price is dependent on a lot of factors that vary according to time.
Normally, CPO price behaviour is determined by market forces, i.e. both supply and demand factors. These are basic fundamental factors that influence CPO prices.

Strong demand for oil palm products will lead to an increase in CPO prices in the market. However, if the supply of palm oil growth is much faster than that of its demand, CPO prices will be affected in a negative manner.

Price of substitute products for palm oil, like soyabean and rapeseed oils has also become a fundamental factor that is able to influence CPO prices in the world market.

Meanwhile, the price of Brent crude oil (BCO) also plays a significant role in terms of influencing CPO prices. This is due to the impact of the biodiesel industry.
FUNDAMENTAL FACTORS AFFECTING CPO PRICES

• CPO price movement depends directly on following fundamental factors:

  1. PO SUPPLY (Production, Stock & Import)
  2. PO DEMAND (Export of OP products)
  3. Price of substitute products (SBO & RSO)
  4. Price of Brent Crude Oil (BCO)

• Based on supply and demand factors, CPO price behaviour reflect equilibrium or volatility.
MONTHLY CPO PRICES, 2008-2012

- This Figure shows monthly CPO price movement from 2008 until 2012. Each point of CPO price shows price equilibrium determined by supply & demand factors.

- Based on Autoregression Conditional Heteroscedasticity (ARCH) and Generalize ARCH (GARCH), volatility index is recorded at 0.8165, which is indicating that high volatility exist in CPO prices.

Source: MPOB
CPO price is also dependent on market sentiments or the speculation factor that is very difficult to predict by economists.

However, market sentiments can sometimes give high impact on CPO price behaviour as compared to fundamental factors.

Usually, very difficult to forecast CPO prices which include the element of market sentiment or speculation factor - can not be measured by time series data.

As an econometrician, dummy variables will be used as a proxy to examine impact of market sentiment on CPO prices.
MARKET SENTIMENTS AFFECTING CPO PRICES

- The extreme weather phenomenon like La Nina & El Nino events and the impact of natural disasters will subsequently cause supply disruption and lead to an increase in prices.

- Political crisis in Middle-East leading to economic crisis: thus, pressure on CPO prices to decline due to low palm oil demand.

- New policy introduction by importing countries unfavorable to PO will cause less demand: decline in CPO prices – e.g. from Jan. 2013, China, P.R. strictly enforced regulations on import of vegetable oils.
PALM OIL SUPPLY FACTORS

- Elements PO supply:

  - Major PO supply components are CPO production and PO closing stock.
  - PO import does not significantly influence PO supply in view of the fact that the volume of PO import is not large enough as compared to CPO production and PO closing stock.
## TOTAL SUPPLY OF PALM OIL, 2012 (TONNES)

<table>
<thead>
<tr>
<th>Month</th>
<th>Production of CPO</th>
<th>Stock of PO</th>
<th>Import of PO</th>
<th>Total Supply of PO</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1.29</td>
<td>2.02</td>
<td>0.21</td>
<td>3.52</td>
</tr>
<tr>
<td>February</td>
<td>1.19</td>
<td>2.06</td>
<td>0.25</td>
<td>3.50</td>
</tr>
<tr>
<td>March</td>
<td>1.21</td>
<td>1.96</td>
<td>0.13</td>
<td>3.30</td>
</tr>
<tr>
<td>April</td>
<td>1.27</td>
<td>1.85</td>
<td>0.12</td>
<td>3.24</td>
</tr>
<tr>
<td>May</td>
<td>1.38</td>
<td>1.79</td>
<td>0.13</td>
<td>3.30</td>
</tr>
<tr>
<td>June</td>
<td>1.47</td>
<td>1.70</td>
<td>0.14</td>
<td>3.31</td>
</tr>
<tr>
<td>July</td>
<td>1.69</td>
<td>2.00</td>
<td>0.09</td>
<td>3.78</td>
</tr>
<tr>
<td>August</td>
<td>1.66</td>
<td>2.11</td>
<td>0.07</td>
<td>3.84</td>
</tr>
<tr>
<td>September</td>
<td>2.01</td>
<td>2.48</td>
<td>0.03</td>
<td>4.52</td>
</tr>
<tr>
<td>October</td>
<td>1.94</td>
<td>2.51</td>
<td>0.06</td>
<td>4.50</td>
</tr>
<tr>
<td>November</td>
<td>1.89</td>
<td>2.57</td>
<td>0.08</td>
<td>4.54</td>
</tr>
<tr>
<td>December</td>
<td>1.78</td>
<td>2.63</td>
<td>0.09</td>
<td>4.49</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>18.78</strong></td>
<td><strong>2.14</strong>*</td>
<td><strong>1.39</strong></td>
<td><strong>22.31</strong></td>
</tr>
</tbody>
</table>

Source: MPOB
Note: *average of PO stock in 2012
CPO PRODUCTION

- CPO production has a seasonal pattern every year which are:
  - Low season starts from November until February
  - Moderate season starts from March until August
  - Peak season either in September or October

- CPO production starts to decline in November until February every year due to monsoon rains:
  - Low lying areas being affected by flood
  - Harvesting and collecting of FFB being disrupted
SEASONAL TREND IN CPO PRODUCTION

Source: MPOB

A = Low season
B = Moderate season
C = Peak season
During monsoon season, harvesting and collecting activities get disrupted and FFB on oil palm trees would become overripe or rotten.
Based on survey (conducted in 2010/2011), the duration of floods occurring in oil palm planted areas was around a week until 4 weeks (majority of respondents affected).

Therefore, harvesting & collecting activities get delayed and this had contributed to FFB loss due to FFB becoming overripe or rotten. This scenario has led to CPO prod. to decline during monsoon season.
Highest number of OP estates affected by floods was in Sabah at 137 estates with an area of 139,004 ha.

Other key producing States also affected by floods: Sarawak, Pahang, Perak and Johor.

Total oil palm estates affected by floods were 401 with an area of 428,912 ha.

Resulting from this phenomenon, Malaysia CPO production always declines from Nov until Feb.
CPO production model developed based on the multiple regression technique.

The purpose of the model: 1) To identify significant factors affecting CPO production; 2) To examine the impact of the monsoon rains and La Nina on CPO production. The general model states as follows:

\[ \text{PDO}_t = f(\text{MAT}_t, \text{OER}_t, \text{DUM}_t) \]

Meanwhile, the specific CPO production model as follows:

\[ \text{PDO}_t = a_1 + a_2\text{MAT}_{t-1} + a_3\text{OER}_t - a_4\text{DUM}_t + e_t \]

Where:
- PDO = CPO production (tonnes) ;  MAT = OP mature areas (ha)
- OER = Oil extraction rate (%)
- DUM = Dummy weather for monsoon rains and La Nina (0 if there is no monsoon rains & La Nina and 1 if there is monsoon rains & La Nina)
- a = Coefficient ;  e = Error term

Note: All time series data in the Log form.
The result shows CPO production is significantly dependent on OP mature areas (MAT), oil extraction rate (OER) & dummy weather (DUM).

This analysis proves that, monsoon rains & La Nina will cause a negative impact on CPO production. When there is monsoon rains & La Niña event, CPO production expected to decline by about 0.05% as compared to without monsoon rains and the La Niña event.

When mature areas & OER increased by 1%, CPO production is expected to increase by 1.1% and 1.2% respectively.

\[
\text{PDO}_t = -3.9699 + 1.1181\text{MAT}_t + 1.2023\text{OER}_t - 0.0450\text{DUM}_t
\]

\[
(-3.7679)^* (51.917)^* (2.9912)^* (-2.0927)^*
\]

Note: **, * indicates t-statistics significance at 1% and 5% respectively.

\[R^2 = 0.9925;\quad F\text{-stat} = 1,373 \text{ (significance at 1%);}\quad DW = 2.1298\]
Based on time series data, there is a positive relationship between CPO production & OP mature areas (in line with the empirical analysis).

CPO production & mature areas recorded positive growth rates since 1980 (refer Table). However, the percentage of growth rates recorded a decreasing pattern, especially for OP mature areas.

<table>
<thead>
<tr>
<th>Year</th>
<th>CPO Production</th>
<th>Mature Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tonnes</td>
<td>Growth Rates (%)</td>
</tr>
<tr>
<td>1975</td>
<td>1,257,573</td>
<td>-</td>
</tr>
<tr>
<td>1980</td>
<td>2,573,173</td>
<td>14.32</td>
</tr>
<tr>
<td>1985</td>
<td>4,134,463</td>
<td>9.48</td>
</tr>
<tr>
<td>1990</td>
<td>6,094,622</td>
<td>7.76</td>
</tr>
<tr>
<td>1995</td>
<td>7,810,546</td>
<td>4.96</td>
</tr>
<tr>
<td>2000</td>
<td>10,842,095</td>
<td>6.56</td>
</tr>
<tr>
<td>2005</td>
<td>14,961654</td>
<td>6.44</td>
</tr>
<tr>
<td>2010</td>
<td>16,993,717</td>
<td>2.55</td>
</tr>
<tr>
<td>2012</td>
<td>18,785,139</td>
<td>5.01</td>
</tr>
</tbody>
</table>

Source: MPOB
Normally, CPO prices are on an increasing trend during the monsoon rains. This is due to:

- When CPO production declined, thus leading to a decline in PO supply (major component for PO supply).
- Negative relationship between CPO prices and PO supply (based on an economic theory).

However, this scenario is not always followed through. This is because if the PO supply shows a declining pattern (supportive CPO prices), but the other factors unsupportive CPO prices (e.g. decrease in PO export & SBO prices), therefore CPO prices can be in a declining trend.
RELATIONSHIP BETWEEN PRODUCTION & CPO PRICE

Graph clearly shows that in Jan-Feb 2011, Nov-Dec 2011, & Jan-Feb 2012 when CPO production at low season due to monsoon rains, CPO prices showed an increasing trend.

Correlation Index = -0.6683 (moderate negative relationship)

Source: MPOB
WHAT IS IN STORE FOR 2013: CPO PRODUCTION

- Malaysian CPO production in 2013 is expected to increase marginally at 19.08 million tonnes due to:
  1. OP matured areas increasing marginally.
  2. Introduction of oil palm replanting scheme with an allocation of funds at RM100 million.

- Oil palm replanting scheme: 100,000 hectares of unproductive palms and palms over the age of 25 years is expected to be replanted.

- Potential of FFB loss estimated at 1,000,000 tonnes based on average FFB yield of 10 t/ha/year (100,000 ha x 10). With average OER at 20%, the estimated potential CPO production is to decline at 200,000 tonnes (1,000,000 T x 0.20).
Palm oil stocks is a component of palm oil supply and comprises both CPO & PPO.

Significant factors affecting PO stock levels: CPO production, PO import & PO export performance.

Relationship between PO stock and CPO price negatively correlated i.e., when PO stock increases, price will decline and when PO stock decreases, CPO price increases.
Monthly Palm Oil Stock Trends in 2012

- High PO stock during the 1\textsuperscript{st} quarter of 2012 due to high carry-over stocks in December, 2011 (close to 2.0 Mn T), and the slow PO export performance.

- During the 2\textsuperscript{nd} quarter of 2012, the decreasing stock trend was due to strong export performance.

- 3\textsuperscript{rd} and 4\textsuperscript{th} quarters of 2012, stock was at high level due to peak production season and slow export performance.

Source: MPOB
RELATIONSHIP BETWEEN PO STOCK & CPO PRODUCTION

- This figure shows that when increase in CPO production, stock of PO also increased.

- Due to CPO production increase to 2.00 Mn T in Sept. 2012 from 1.66 Mn T in Aug. (21% increase), PO stock increased to 2.48 Mn T from 2.11 Mn T (18% increase) for the same period.

Source: MPOB
• This figure shows very difficult to prove that PO import has positive impact on PO stock level.
• From June until September 2012, while PO import shows a downward trend, however, PO stock shows an upward trend.
This figure proves PO stock has a negative relationship with PO export performance.

From June until Sept. 2012 when PO export witnessed a weak performance, while PO stock showed an increasing trend.

Source: MPOB
This figure shows monthly price behaviour in 2012 was strongly influenced by PO stock levels.

The CPO price bearishness in the 4th quarter of 2012 can clearly be observed due to high PO stock levels during this period.

Correlation Index = -0.8694 (strong negative relationship)

Source: MPOB
WHAT IS IN STORE FOR 2013: PALM OIL STOCKS

- High carry-over PO stock in Dec. 2012 at 2.62 Mn T had contributed to the high PO stock level in the 1st quarter of 2013 (to be above 2.0 Mn T).

- The introduction of the oil palm replanting scheme & the B5 programme is expected to reduce PO stock levels in 2013:
  - The oil palm replanting scheme is expected to reduce CPO production to 200,000 tonnes.
  - The B5 programme is to be expanded throughout Malaysia, which will also reduce the level of palm oil stock availability in the country.

- However, impact of oil palm replanting scheme and the B5 programme on PO stock and CPO prices to be evident during 3rd and 4th quarters of 2013.
Malaysia PO import trend was on an increasing trend between 2008 until 2012 with growth rates of 18.61% (for the period of 5 years).

In 2012, the import of PPO was recorded more than that of CPO, with import volume 795,000 tonnes & 596,000 tonnes respectively: due to the export duty on Indonesian PPO lower than CPO.

In 2012, the export duty on Indonesian PPO ranged between 3%-10%. The export duty on CPO in Jan was 18%, Feb & Mar 16.5%, Apr. 18%, May & Jun. 19.5%, Jul. & Aug. 15%, Sept & Oct 13.5% & Nov-Dec 9%.
In 2011 & 2012, highest PO import was recorded in Feb. at 189,411 T & 246,419 T respectively. High PO import due to low CPO production in Malaysia arising from monsoon rains.

In 2011 & 2012, lowest PO import was recorded in Oct. & Sep. at 45,478 T & 32,830 T respectively. Low PO import due to the peak CPO production season in Malaysia during these months.

This indicates a negative relationship between PO import & CPO production.
This figure clearly shows when CPO production decreases, PO import increases & vice-versa.

For e.g. in Feb. CPO production was low at 1.19 Mn T, while PO import was highest at 0.25 Mn T. Meanwhile, during the peak CPO production season in Sept. at 2.00 Mn T, PO import was lowest at 0.03 Mn T.

Correlation Index = -0.8364 (strong negative relationship)

Source: MPOB
This Figure shows there is no evidence that PO import has any negative relationship with CPO prices in 2012, even though PO import as a PO supply component.

The reason is due to PO import volume was not large enough to give an impact on CPO price behaviour in the market place.
Palm oil import in 2013 is expected to continue to increase marginally.

Arising from the relatively low export tax on PPO by the Indonesian Government in 2013, Malaysia is expected to export more PPO than CPO.
The demand for OP products comprises both semi-processed and end products

Malaysia OP products exported to more than 100 countries

Major importing countries for Malaysia OP products in 2012: China, P.R., India, EU, Pakistan and USA.

Total export volume and value of OP products in 2012 were at 24.56 Mn T & RM71.40 billion respectively.
<table>
<thead>
<tr>
<th>Products</th>
<th>2011</th>
<th>2012</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Volume (Tonnes)</td>
<td>Value (RM Million)</td>
<td>Volume (Tonnes)</td>
<td>Value (RM Million)</td>
</tr>
<tr>
<td>Crude Palm Oil</td>
<td>3,477,599</td>
<td>11,103.4</td>
<td>4,633,686</td>
<td>13,450.82</td>
</tr>
<tr>
<td>Processed Palm Oil</td>
<td>14,515,666</td>
<td>49,368.4</td>
<td>12,929,155</td>
<td>39,506.41</td>
</tr>
<tr>
<td><strong>Total Palm Oil</strong></td>
<td>17,993,265</td>
<td>60,471.9</td>
<td>17,562,841</td>
<td>52,957.24</td>
</tr>
<tr>
<td>Crude Palm Kernel Oil</td>
<td>205,457</td>
<td>908.4</td>
<td>220,132</td>
<td>653.27</td>
</tr>
<tr>
<td>Processed Palm Kernel Oil</td>
<td>970,746</td>
<td>5,188.9</td>
<td>863,344</td>
<td>3,441.09</td>
</tr>
<tr>
<td><strong>Total Palm Kernel Oil</strong></td>
<td>1,176,203</td>
<td>6,097.4</td>
<td>1,083,476</td>
<td>4,094.35</td>
</tr>
<tr>
<td>Palm Kernel Cake</td>
<td>2,227,410</td>
<td>924.7</td>
<td>2,459,526</td>
<td>1,021.16</td>
</tr>
<tr>
<td>Oleochemicals</td>
<td>2,181,430</td>
<td>10,846.9</td>
<td>2,600,812</td>
<td>11,455.66</td>
</tr>
<tr>
<td>Biodiesel</td>
<td>49,999</td>
<td>179.7</td>
<td>28,983</td>
<td>98.44</td>
</tr>
<tr>
<td>Finished Products</td>
<td>402,909</td>
<td>1,717.1</td>
<td>360,795</td>
<td>1,492.98</td>
</tr>
<tr>
<td>Others</td>
<td>240,456</td>
<td>173.8</td>
<td>465,197</td>
<td>275.95</td>
</tr>
<tr>
<td><strong>Total Oil Palm Products</strong></td>
<td>24,271,672</td>
<td>80,411.4</td>
<td>24,561,620</td>
<td>71,395.77</td>
</tr>
</tbody>
</table>

Source: MPOB
## PO Export to Major Destinations

<table>
<thead>
<tr>
<th>No.</th>
<th>Country</th>
<th>2011</th>
<th>2012</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>European Union</td>
<td>2,006,093</td>
<td>2,220,794</td>
<td>10.70</td>
</tr>
<tr>
<td>3.</td>
<td>Pakistan</td>
<td>1,821,009</td>
<td>1,343,254</td>
<td>(26.24)</td>
</tr>
<tr>
<td>4.</td>
<td>India</td>
<td>1,667,908</td>
<td>2,631,406</td>
<td>57.77</td>
</tr>
<tr>
<td>5.</td>
<td>U.S.A</td>
<td>1,054,997</td>
<td>1,029,443</td>
<td>(2.42)</td>
</tr>
<tr>
<td>6.</td>
<td>Others</td>
<td>7,461,130</td>
<td>6,836,284</td>
<td>(8.37)</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>17,993,265</strong></td>
<td><strong>17,562,858</strong></td>
<td><strong>(2.39)</strong></td>
</tr>
</tbody>
</table>

Source: MPOB
The Malaysian PO industry is more export-oriented. Portion for PPO export as compared to CPO production is ranging from 86% to 98% for periods of 2005 to 2012.

Therefore, it can be concluded that Malaysia CPO price behaviour is more dependent on world demand factors as compared to the domestic factor.

### CPO Production & PPO Export (Tonnes)

<table>
<thead>
<tr>
<th>Year</th>
<th>CPO Production</th>
<th>PPO Export</th>
<th>% Export</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>14,961,654</td>
<td>13,445,511</td>
<td>89.87</td>
</tr>
<tr>
<td>2006</td>
<td>15,880,786</td>
<td>14,423,168</td>
<td>90.82</td>
</tr>
<tr>
<td>2007</td>
<td>15,823,745</td>
<td>13,746,823</td>
<td>86.87</td>
</tr>
<tr>
<td>2008</td>
<td>17,734,441</td>
<td>15,412,512</td>
<td>86.91</td>
</tr>
<tr>
<td>2009</td>
<td>17,564,937</td>
<td>15,880,744</td>
<td>90.41</td>
</tr>
<tr>
<td>2010</td>
<td>16,993,717</td>
<td>16,664,068</td>
<td>98.06</td>
</tr>
<tr>
<td>2011</td>
<td>18,911,520</td>
<td>17,993,265</td>
<td>95.14</td>
</tr>
<tr>
<td>2012</td>
<td>18,785,139</td>
<td>17,562,841</td>
<td>93.49</td>
</tr>
</tbody>
</table>

Source: MPOB
Based on an economic theory, the relationship between OP export products (as a proxy for PO demand) with CPO prices is negatively correlated.

The negative relationship between both variables can be witnessed from July until November 2012, which was when CPO prices declined, and OP export products increased.

Correlation Index = -0.6568 (moderate negative relationship)
The demand for PO in world market is also dependent on price behaviour of the substitutes product e.g. soyabean (SBO) & rapeseed oils (RSO).

This figure clearly shows that CPO, SBO and RSO prices move in tandem and CPO prices always being at discount to them.

Wider the gap between CPO and SBO prices, the higher the PO demand – will lead to increase in CPO prices.
Palm oil demand model developed based on the multiple regression technique.

The purpose of the model is to identify significant factors influencing OP export products by Malaysia. The general model can be stated as follows:

\[ DD_t = f(CPO_t, SBO_t, PDO_t, STO_t, DD_{t-1}) \]

The specific PO demand model can be stated as follows:

\[ DD_t = c_1 - c_2 CPO_t + c_3 SBO_t + c_4 PDO_t - c_5 STO_t + c_6 DD_{t-1} + e_t \]

Where:
- \( DD = \) Total OP export products (tonnes); \( CPO = \) CPO price (RM/T)
- \( SBO = \) Soyabean oil price (US$/T); \( PDO = \) CPO prod. (tonnes)
- \( STO = \) PO stock (tonnes)
- \( c = \) Coefficient ; \( e = \) Error term

Note: All time series data in the Log form
The result shows that OP export products is significantly dependent on CPO prices (CPO), SBO price (SBO), CPO production (PDO), PO stock (STO) and OP export products at lagged 1 (DD_{t-1}).

Analysis proves that, the OP export products has a negative impact on CPO price and PO stock. When CPO price & PO stock increases by 1%, PO demand is expected to decline by about 0.11% & 0.08% respectively.

Meanwhile, when SBO price and CPO production increases by 1%, PO demand is expected to increase by about 0.10% and 0.75% respectively.

\[
\begin{align*}
DD_t &= -0.2236 - 0.1129CPO_t + 0.1022SBO_t + 0.7478PDO_t \\
&\quad - 0.0833STO_t + 0.3453DD_{t-1} \\
&= (-0.8867) \quad (-1.9276)^* \quad (1.7956)^* \quad (6.0805)^** \\
&\quad - (1.3354) \quad (3.5796)^**
\end{align*}
\]

Note; **, * indicates t-statistics significance at 1% and 10% respectively.

\[R^2 = 0.9965; \quad F\text{-stat} = 1,759 \text{ (significance at 1%);} \quad DW = 2.1606\]
WHAT IS IN STORE FOR 2013: EXPORT OF OP PRODUCTS

- Export of oil palm products is expected to increase marginally in 2013.

- The expected gradual world economic recovery in the first half of 2013 to contribute to the marginal increase in export of oil palm products.

- The introduction of Malaysia’s new CPO tax export structure between 4.5% to 8.5% effective in Jan 2013 will contribute to the increase in CPO export.

- The wider price discount between CPO and SBO prices will boost palm oil export, especially in the 1st quarter of 2013 – will lead to increase in CPO prices.
After Malaysia exported palm methyl ester as a biodiesel product and implemented the B5 programme, there was a strong positive relationship between CPO and BCO prices.

The correlation index between both prices recorded at 0.7428, which is indicating a high correlation between both prices.
FACTORS AFFECTING CPO PRICE BEHAVIOUR: EMPIRICAL EVIDENCE

- CPO price model developed based on the multiple regression technique.
- The purpose of this model is to identify significant factors influencing CPO price behaviour. The general model can be represented as follows:
  \[ CPO_t = f(PDO_t, STO_t, DD_t, SBO_t, BCO_t, CPO_{t-1}) \]

- Meanwhile, the specific CPO price model can be stated as follows:
  \[ CPO_t = c_1 - c_2 PDO_t - c_3 STO_t + c_4 DD_t + c_5 SBO_t + c_6 BCO_t + c_7 CPO_{t-1} + e_t \]

Where:
- CPO = CPO price (RM/T) ; PDO = CPO production (tonnes) ;
- STO = PO stock (tonnes) ; DD = OP export products (tonnes) ;
- SBO = SBO price (US$/T) ; BCO = Brent crude oil price (US$/barrel).
- c = Coefficients ; e = Error term

- Note: All time series data in the Log form.
The result shows that CPO price behaviour is significantly dependent on all independent variables in the model.

This analysis proves that CPO price behaviour has a negative relationship with CPO prod. & PO stock. When CPO prod. & PO stock increases by 1%, CPO prices is expected to decline 0.21% & 0.35% respectively.

However, when PO export, SBO price, & BCO price increases by 1%, CPO price is expected to increase by 0.15%, 0.55% & 0.04% respectively.

\[ \text{CPO}_t = 6.2540 - 0.2063\text{PDO}_t - 0.3466\text{STO}_t + 0.1465\text{DD}_t + 0.5541\text{SBO}_t \]
\[ + 0.0357\text{BCO}_t + 0.4389\text{CPO}_{t-1} \]
\[ (4.5333)** (-2.8679)** (-4.1662)** (2.0034)* (4.2179)** \]
\[ + 0.5536 \]
\[ (0.5536) \]
\[ (3.5352)** \]

Note; **, * indicates t-statistics significance at 1% and 5% respectively.

\[ R^2 = 0.9020; \quad F\text{-stat} = 98.22 \text{ (significance at 1%);} \quad \text{DW} = 1.7825 \]
Based on demand and supply factors, it is evident that CPO price is likely to be firmer in 2013.

PO supply is expected to increase marginally due to the introduction of the replanting.

PO Demand is expected to be on upward trend due to the world economic recovery, the new tax structure that helps CPO to be exported more competitively and the B5 programme.

Wider price discount of CPO vis-à-vis SBO prices is to boost PO demand in the short-term and can lead to increase in CPO prices in the short-term.
CPO price behaviour crucially dependent on PO supply and demand factors.

On the supply side, both CPO production and PO stock play a significant role in terms of influencing CPO price behaviour.

On the demand side, export of oil palm products is a key factor influencing CPO price behaviour.

CPO price behaviour will result in ‘shock’ reaction if the element of market sentiment becomes unpredictable.

The combination of fundamental and market sentiment factors are considered the ‘rule of thumb’ that will determine CPO price equilibrium in the world market.
Thank You Very Much For Your Interest & Time.
Look Forward To Your Feedback or Comments.

ayat@mpob.gov.my