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## DIMINISHING UNCERTAINTY IN AGROCHEMICALS WITH FINANCIAL DERIVATIVES

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### ABSTRACT

The main purpose of financial derivatives is to diminish the risks related to the commercialisation of financial assets that may have certain levels of price instability. Companies entering the financial derivatives market might choose a financial position and type of contract that best suits their needs. This study merely evaluates forward contracts as a tool to hedge severe price fluctuations in agrochemicals, due to its increasing importance in today's economy. To do so, historical volatility is measured through the Generalised Auto Regressive Conditional Heteroscedasticity of three commonly commercialised agrochemical products. The data exhibits high levels of price variation on these products and proves the feasibility of introducing agrochemical products in financial derivatives markets to trade them as commodities. Additionally, to determine the forward prices of these products, a modified Kaldor's valuation formula is implemented. The analysis reveals a favourable stance for the holder of the commodity position; this provides financial stability for agricultural producers.

**Keywords:** agrochemical products, financial derivatives, forward contracts, spot price, price volatility.

### INTRODUCTION

Trading in international markets is characterised by uncertainty. More specifically, the international trade of commodities such as gold, oil, agricultural products often presents high levels of price volatility. According to Doporto and Michelena (2011), factors that might have an influence on the price of commodities include inflation, exchange rates, interest rates, speculation and the volatility of other financial assets. Abrupt changes in these factors can cause unexpected difficulties in the supply and demand of commodities, generally increasing uncertainty and price fluctuation.

According to Rossi (2013) the volatility in commodity prices has a huge impact on business decisions and outcomes, which in some cases might affect the development of small and open countries, causing macroeconomic instability. Therefore, due to the impact of price fluctuations in commodities, it is necessary that importers and exporters look for mechanisms to hedge those inherent risks. Quetsch (2014) explains *hedging* as the action of taking offsetting positions in the market to manage risks. This helps to lower the vulnerability faced by economic agents when sudden price variations occur. It also grants hedgers the necessary supply of inputs. Such risk management efforts are also important for portfolio management (Chang and McAleer, 2015). Hedging exertions are also applicable in the case of agrochemical products, as price volatility has an enormous impact on its commercialisation.

Lapan et al. (1998) proposed prediction models for future markets, and found it favourable to venture into those markets as an alternative to counteract the risk that unpredictable price changes imply. Graham and Rogers (2002) concur with the latter as they estimate that minimising the risks undertaken by companies might lead them to increase business value. Concordantly, Bartram, Brown and Fehle (2009) state that effectively using these financial tools is critical in limiting the severity of economic downturns in developing economies. The preceding stimulates the central inquiry of this research: how to mitigate price volatility on a key agronomic raw material affecting agricultural producers?

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The case of agrochemicals products is not isolated. These agri-inputs, which are widely traded in the global market, have also shown extremely high and low prices, which might justify its use in the commodity derivatives market. The following paper analyses historical data to evaluate price volatility and the possibility of using forward contracts in the commercialisation of agrochemical products across the globe. The literature review covers basic concepts, including the current and historical situation of agrochemical industry worldwide. We analysed volatility and forward price valuation, whereas the methodology encompasses valuation models applied to the current situation of the agrochemical industry.

## LITERATURE REVIEW

### Agrochemical industry background

Agrochemicals consumption has increased worldwide and become highly necessary in the production of crops, mainly because of their role ensuring good harvests by protecting crops against diseases, weeds and pests. The effective use of agrochemicals has successfully solved various problems, with an impact on the developments of many countries (Kisamo and Mndeme, 2002).

In agricultural production, farmers have to incur several production costs such as the purchase of raw materials (seeds), labour, ground preparation and overheads. From all these costs, agrochemicals have the greatest impact on the financial plan of agricultural entrepreneurs. Table 1 shows agricultural costs expressed as percentages.

Production cost	%
Seed	0.20%
Ground preparation	0.24%
Workforce	23.29%
Agrochemicals	48.04%
Indirect materials	28.23%
<b>TOTAL</b>	<b>100.00%</b>

**Table 1. Agricultural costs in percentages.**

The agrochemical industry, according to Moros *et al.* (2006), represents one of the world's major industries, since more than 50% of the world's population is highly dependent on agriculture for its livelihood. Its growth is mainly subject to the increase in the global population, which increases food demand. Concurrently, agrochemical demand increases since they contribute to the improvement of crops' production by providing macro and micronutrients, protection for plant diseases, soil nutrient restoration, and more. Currently, Asia Pacific dominates the market of agrochemicals globally, and is expected to remain dominant. This is due to the exponential increase in demand for food crops from key countries like India and China. Furthermore, these countries have a competitive advantage on labor and overheads, decreasing conversion costs. As of 2014, some of the most important participants in this market were BASF, Bayer, Monsanto, Syngenta, Valent Biosciences, Adama and FMC.

This industry, as stated by Joly and Lemarié (2002), is a maturing one, and thus it faces several major problems such as increasing internal competition, high environmental standards and decreasing returns in research and development. According to Beckmann (2014), another main problem is the relevant price fluctuation of agricultural products. Since both industries are related, uncertainty in the agricultural arena and its derivatives (which are also commodities)<sup>2</sup> directly affects the supply and demand of agrochemicals, causing its prices to be volatile.

<sup>2</sup> It refers to agricultural products

Amine, Paraquat and Glyphosate are three of the main agrochemical products traded globally due to their relevance in crop production. These will consequently be analysed in the present study. Weinong (2014) explains the specific case of price fluctuations of glyphosate in 2008 and 2013 as a result of insufficient supply and rigorous environmental regulations. Genetically modified crops also contributed to the increase in the demand of glyphosate. Soybean and corn planting acreage increased in the United States, Ukraine and South America, leading to a shortage of agrochemicals steering upwards the price. Yet glyphosate still accounts for more than 20% of the total export value of pesticides, and has kept growing fast. According to Dharni and Singh (2011), for agri-input buyers, price is the most important factor for decision making. One of the main reasons that could directly affect this behaviour is that the agrochemicals have probably entered the commodity phase.

Commodities are marketable items that aim to satisfy needs and wants. A condition that defines commodities is that their price, regardless of the providers, is generally the same; thus when prices fluctuate, it affects markets as a whole. Price fluctuations, however, are a normal and necessary element in competitive markets. When these fluctuations can, however, no longer be measured up front and become increasingly uncertain, the efficiency of price systems start to crumble. This explains why, as stated by Combes (2002), persistent volatility in commodities represent increasing vulnerability in economies.

#### ***Volatility valuation models***

Although standard deviation has been widely used to determine how prices have fluctuated in the past, this approach presents shortcomings when used to determine future price instability. For example, it assumes *ceteris paribus* on a myriad of exogenous variables affecting the price of a commodity. It also ignores all the observations before and after the date that researchers arbitrarily select to gather their analysis, tending to under or overestimate volatility.

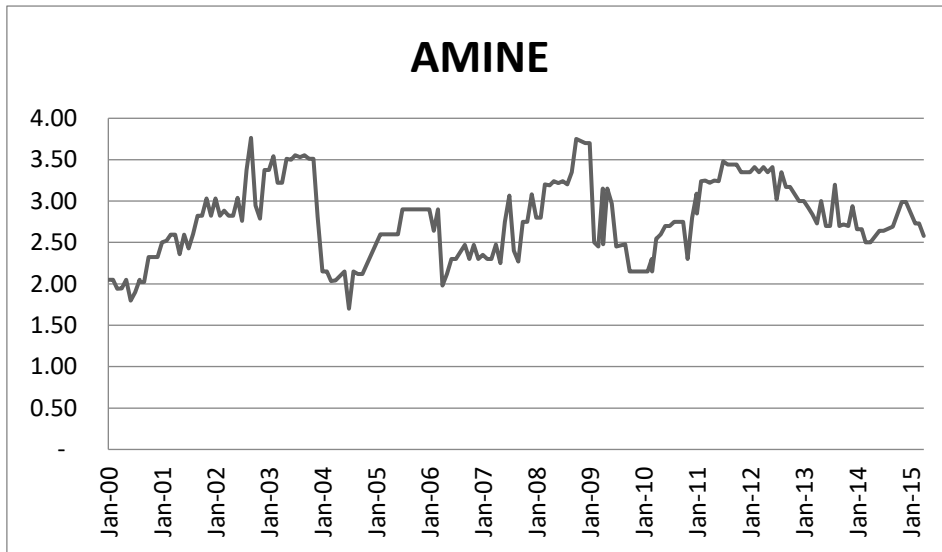
To evaluate products whose price varies over a period, time series analysis becomes critical. Engle (1982) proposed a model of autoregressive conditional heteroscedasticity, **ARCH**, in which variance is dependent on the square of past innovations. The GARCH model (generalised autoregressive conditional heteroscedasticity) proposed by Bollerslev (1986) indicates that variance not only depends on the square of past innovations, but also on conditional variances of previous terms. Karolyi (1995) adds that these models incorporate time deviation in the volatility of daily and monthly price changes and returns. Nelson (1991) modified the model, developing EGARCH (exponential autoregressive conditional heteroscedasticity), in which the model for conditional variance does not behave symmetrically with positive and negative innovations, but is asymmetric to the peaks and falls of the asset price. Some researchers support and give different approaches to the theory; however, the models are mostly used for financial assets, namely stocks, commodities, currencies and others. These models require daily closing prices to enhance accuracy.

#### ***Problem formulation***

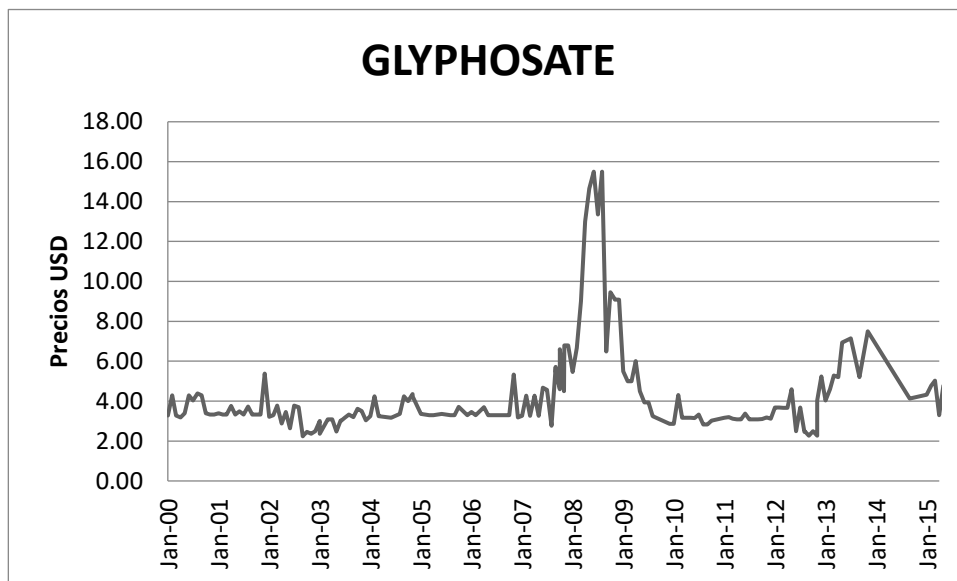
Agrochemicals, as other commodities, also face a major drawback when they are being commercialised in international markets: volatility. The price volatility (Yang, Balyeat and Leatham, 2005) of raw materials thus becomes a hazard for producers due to price fluctuation affecting net income. When prices of commodities are volatile, therefore, it becomes necessary to find alternatives that reduce the related risks. In the specific case of the agrochemicals industry, volatility has become a feature present over the years. Agents of this market might therefore seek for alternatives to guarantee stability on supply prices, such as the inception of agrochemicals as a financial derivative.

There are several characteristics that a product (specifically a commodity) has to comply with to enter the derivatives market. For instance, commodities have to be traded in competitive markets, with a great number of buyers, sellers and operators. It also has to be sufficiently homogeneous and, overall, it has to present price volatility (Figures 1, 2 and 3).

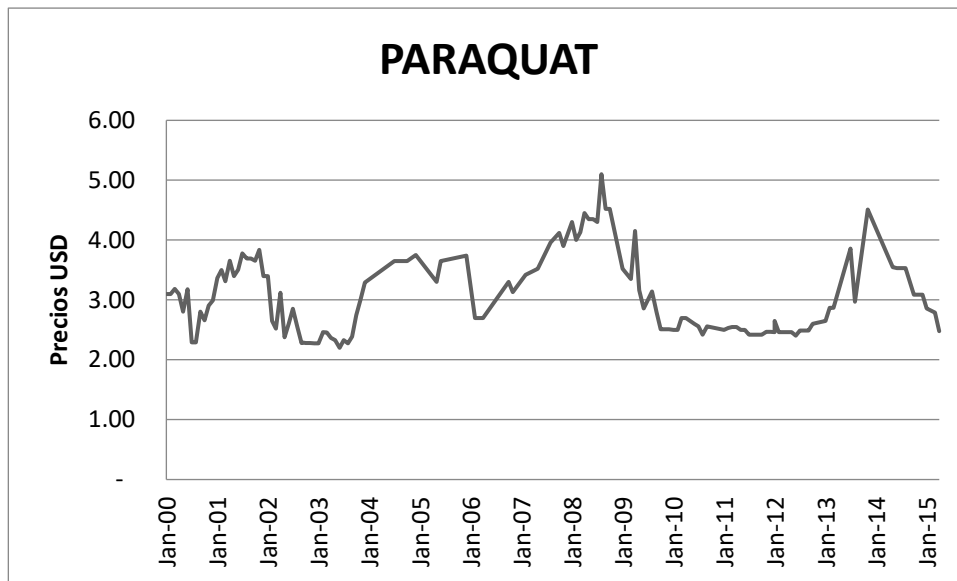
Agrochemicals not only meet all those characteristics, but they could be traded in a derivative market, since they are long term products. These products last up to two years when being stored under appropriate conditions.



**Figure 1. Line graph of the market prices of amine from January 2000 to April 2015.**



**Figure 2. Line graph of the market prices of glyphosate from January 2000 to April 2015.**



**Figure 3. Line graph of the market prices of paraquat from January 2000 to January 2015.**

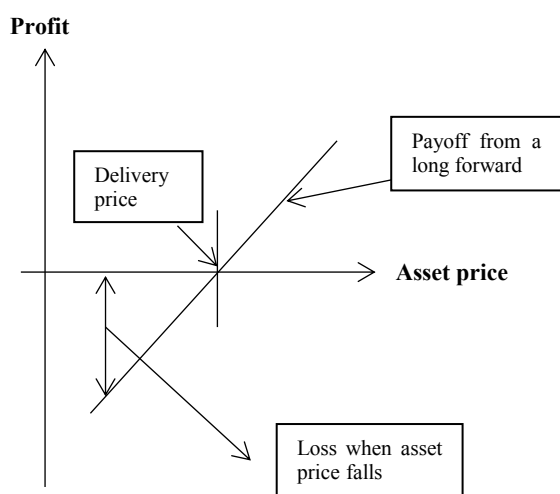
Appendix 1 reveals the historical prices of amine, glyphosate and paraquat over the past fifteen years. Throughout this period of time turmoil in the form of price volatility can be observed (Figures 1, 2 and 3).

Due to agrochemical volatility, it would be feasible for agricultural agents have the need to use financial tools that allow the determination of a prospective price in the previously mentioned supplies. Agricultural business productivity fluctuates due to a myriad of exogenous factors such as weather, crop productivity, and plagues, among others. A highly standardised future contract does not adjust to the industry requirements due to the lack of proper quantity forecasts. Additionally, according to Kroszner (2000), future contracts also require the mediation of a clearinghouse for risk and control management, taking the role of coinsurance between the members during crisis. The current financial infrastructure does not adequately provide the facility of a clearinghouse for the proposed product. Furthermore, the investigation proposes a simple method to mitigate the uncertainty caused by price volatility. Issuing a forward contract could thus solve the agricultural entrepreneurs' conundrum. We extrapolate and integrate Parsons' (1989) perspective into our product. He states that one of the main advantages of this derivative instrument is that it allows companies to cover future cash flows, while avoiding uncertainty in the market.

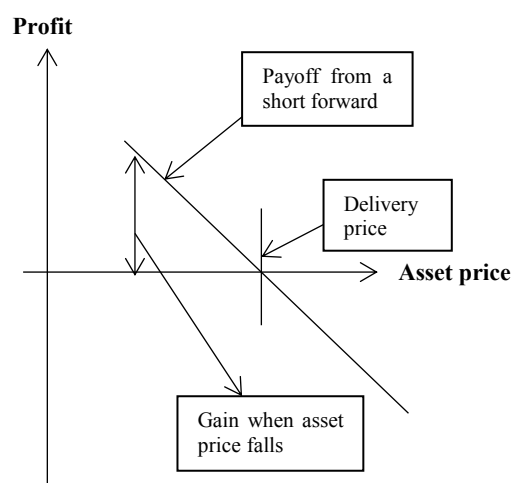
#### ***Forward contracts: An overview***

Forward contracts are agreements between two parties to buy or sell specific quantities of a particular asset at a certain time in the future, and at a price that is settled in advance. Economic agents would thus not be concerned about price fluctuations. The assets involved in forward contracts, known as underlying assets, can either be financial instruments, currencies or commodities. The amounts in the contract are delivered at the expiration or maturity date at the prices that were agreed up front (Haugh, 2010). Forward contracts are effective tools for hedging risks, allowing buyers and sellers to decrease risks by establishing a predetermined quantity and price prior to the actual exchange of goods and services (Dau-Schmidt, 2012). It is actually a *hedger-hedger* contract, since both parties are seeking to hedge a particular exposure related to their businesses.

Masson (2011) explains that the parties of these contracts are generally producers, consumers, brokers or institutional investors. The party that wants to purchase the underlying asset holds a long position, whereas the party that would like to sell the commodity has a short position. For the party who believes that prices of raw materials will experience an upward spiral, it will be convenient to adopt a long position, and profit will be accomplished when the price of the underlying asset rises in the market. Conversely, the economic agent who thinks that prices will plummet will find it feasible to have a short position, and its gains will occur when the market price of the asset falls. In January 2008, the price of glyphosate tripled, from \$5.47 per liter to \$15.50 in August of the same year. This represents a variation of 183.43%. For the buyer of the agrochemical raw material, it could have been convenient to assume a short position, while for its counterpart, a long position could have been economically appropriate. Figures 4 and 5 epitomise Masson's statement.



**Figure 4. Long position**



**Figure 5. Short position**

These instruments are legally binding contracts with repercussions if broken, which reassures the parties involved that the conditions settled will be met by the expiration date (as opposed to verbal agreements). Nevertheless, an important shortcoming is the struggle to find counterparties that agree to the specification of the contracts. Forward contracts are *zero-sum games*, where the gains of one party are the losses of its counterparty.

According to Fernandez et al. (2015), two situations might arise in the forward contracts market, depending on the evolution of the price of the commodity: *contango*, which refers to the situation where the price of the commodity for future delivery is higher than the spot price, or *backwardation*, when the price of the commodity for future delivery is lower than the spot price. The latter is not a normal market situation and it suggests shortcomings in the supply of the commodity.

#### **Forward contracts: Price valuation theories**

Kaldor (1939) explains the *theory of storage* as the fundamental supply and demand conditions that determine the spread between spot and forward prices. Commodity prospective forward and spot prices will be set according to storage costs, inventory levels and convenience yield. The latter, as Brennan (1991) explains, is the overall benefit that producers perceive by holding the spot commodity as opposed to holding it as a forward contract. The supporting studies carried by Working (1948), Tesler (1958), Williams (1986), and Deaton and Laroque (1992) have contributed to Kaldor's theory, analysing the empirical evidence of inventory behaviour (Hillard and Reis, 1998). Fama and French (1987) concluded that most of the implications in the theory of storage were correct, and explained that two main reasons support the existence

of convenience yield. First, agents who hold the physical commodity might benefit from being able to meet unexpected demand. Second, the commodity supply could be used as an input in the production process at any time. Perales (2010) corroborates the previous author, mentioning that spot and futures price volatility are influenced by supply and demand fundamentals.

Before Kaldor's theory gained much support, Brennan and Schwartz (1985) proposed a model to assess forward prices using a geometric Brownian motion (GBM), assuming that the whole uncertainty when evaluating commodities was dependent on one sole factor: the spot price. As such, the authors represented the futures price as a function of the spot price and the time to maturity, maintaining a constant convenience yield. Later, it became evident that more factors were needed to value a commodity properly, leading Gibson and Schwartz (1990) to present a two-factor model. This model assumed that both the spot price as well as the spot convenience yield followed a stochastic process. Afterwards, Hillard and Reis (1998) proposed a three-factor model, which included the stochastic convenience yield, interest rates, and jumps in the spot price. The study concluded that the difference between this model and the two-factor model depended mainly in the correlation of spot price and interest rates, and the correlation of convenience yield and interest rates. This valuation does not, however, significantly affect forward and future prices as much as it affects the price of options.

Yan (2001) presented a model that examines the commodity return based on the prices of oil and gold. The main deficiency of this study was that it did not cover volatility. Afterwards, Yan (2002) presented a different model that encompasses stochastic convenience yields, interest rates and volatility. This multi-factor model shows that all these factors play important roles on the pricing of forwards.

#### METHODOLOGY

Appendix 1 shows the historical daily closing prices of amine, glyphosate and paraquat from 2012 to 2015 in US dollars. The price variation was estimated using the logarithm change on equation 1. These figures were collected from FOB market prices in dollars per litre of each product.

$$P\Delta = \ln\left(\frac{q2}{q1}\right) \quad (1)$$

Where:

$P\Delta$  is price variation

$q2$  is the most recent period, and

$q1$  is the preceding period.

#### Volatility valuation

According to Lee et al. (2015), variance and the standard deviation valuation can explain commodity volatility because both include differences of the values from the mean. However, the authors conclude that, since variance is calculated by squaring the units of the standard deviation, the former might cause misperceptions in interpreting the data. To obtain an in-depth analysis of the volatility of this commodity, therefore, this research study used GARCH (Bollerslev, 1986; Karolyi, 1995). This allows capturing data variation, addressing the fact that the conditional variance depends not only on  $p$  squares from the innovations, but also on the  $q$  past values from the variance; thus the model GARCH ( $p,q$ )<sup>3</sup> is described in equation 2.

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^p \alpha_i v_{t-i}^2 + \sum_{i=1}^q \beta_i \sigma_{t-i}^2 \quad (2)$$

<sup>3</sup> In finance, it is usually estimated GARCH (1,1).

Where:

$\alpha_0$  is the long run variance  
 $V^2$  is the returns squared  
 $\sigma^2$  is the variance  
 $\alpha$  is the weight of returns  
 $\beta$  is the weight of variance  
 $p$  is innovations, and  
 $q$  is the variance past values.

Besides volatility, the investigation also estimates the price of the forwards contracts to be negotiated. This is discussed in the next section.

#### *Forward price valuation*

The theory of commodity price valuation introduced by Kaldor (1939) considers a no-arbitrage argument, as depicted in equation 3:

$$f^T(t) = S(t) [1 + (r(t, T) + c(t, T) - y(t, T)) (T-t)] \quad (3)$$

Where:

$f^T(t)$  is the forward price of the commodity  
 $S(t)$  is the spot price  
 $r(t, T)$  is the annual interest rate  
 $c(t, T)$  is the cost of storage calculated annually, and  
 $y(t, T)$  is the marginal convenience yield.

Since the object of this study is to hedge, it is presumed that the underlying asset does not render income. Therefore, Kaldor's formula was adapted to fit the parameters of our research as depicted in equation 4.

$$f_0 = (S_0 + u)e^{(r-c)T} \quad (4)$$

Where:

$f_0$  is the forward price of the commodity at time 0  
 $S_0$  is the spot price of the commodity at time 0  
 $r$  is the interest rate  
 $u$  is the fixed cost of storage  
 $c$  is the convenience yield  
 $T$  is the time in days that the contract will last, and  
 $e$  is the base of the natural logarithm, which is  $\approx 2.71828$ .

Data analysis of costs per litre of amine, glyphosate and paraquat of FOB closing prices from Asian markets are used as the spot price ( $S_0$ ) respectively. LIBOR rate was used as ( $r$ ) and the cost of storage ( $u$ ) was determined on real prices. ( $T$ ) contract matures in 90 days. ( $c$ ) Since the asset is carried in inventory, this provides the possibility to profit from (hedge) momentary shortages. This becomes a convenience yield in the life of the asset, providing a benefit to the holder of the asset but not to the holder of the forward.



## RESULTS

Product	$\mu$	Max	Min
Paraquat	0,06%	68,76%	-52,41%
Amine	0,01%	58,90%	-56,44%
Glyphosate	0,05%	141,37%	-24,12%

**Table 2. Descriptive statistics for amine, glyphosate and paraquat.**

### Volatility valuation

The research considers 250 observations per product for all calculations. Table 2 depicts daily data for the three products researched. It shows maximum and minimum variations along with the average. Commodity daily price variation fluctuated vividly as amine, paraquat and glyphosate changed, reaching a maximum variation of 58.90%, 68.76% and 141.37%, respectively. Figures of price fluctuation on a yearly basis reveals staggering statistics for the same products: 387%, 567%, 1386%, respectively. To assimilate properly the phenomena of price variability, the study measures volatility implementing GARCH from equation (2). Its results are highlighted in Table 3.

Product	$\Omega$	$\alpha$	$\beta$	$\mu$	$\sigma^2$ day	$\sigma^2$ year
Paraquat	0,01	0,39	0,41	0,06%	1,55%	386,82%
Amine	0,01	0,10	0,36	0,01%	2,27%	566,88%
Glyphosate	0,03	0,00	0,35	0,05%	5,54%	1385,60%

**Table 3. Volatility calculated using GARCH**

The data used to calculate the preceding metric was calculated from the logarithmic price variation using equation 1. Parameters  $\Omega$ ,  $\alpha$  and  $\beta$  on Table 3 were determined using an econometrical Excel-based add-in (Annen, 2005), with  $\mu$  as the average. The volatility of paraquat, amine and glyphosate are astounding, as revealed by GARCH  $\sigma^2$  on Table 3: daily 1.55%, 2.27% and 5.54% and yearly 386.82%, 566.88% and 1385.60% respectively.

A financial assessment of the prospective losses due to price volatility requires further quantification. The study employs parametric Value at Risk (VaR) (Jorion, 1996) to estimate the maximum expected loss over a year under market conditions. This research utilises 95% confidence, therefore  $\alpha = 5\%$ . VaR is broadly defined in equation 5

$$VaR = Z_{\alpha} * \sigma \quad (5)$$

Where:

$Z$  is the number of  $\sigma$ , and  
 $\sigma$  is the volatility.

This research adapts this notion in a pragmatic manner in equation 6:

$$VaR = V_0 - V_c \quad (6)$$

Where:

$V_0$  is the initial value, and  
 $V_c$  is the cut-off value.

We assume that  $V_0$  is \$1000.  $V_c^4$  uses the average of the variations and  $\sigma$  from the square root of GARCH ( $\sigma^2$ ). According to VaR, *ceteris paribus* Paraquat losses per \$1000 are \$204, Amine \$248, Glyphosate \$387. This significantly augments the uncertainty for customers as it makes it more difficult to determine the prospective price to be disbursed.

### Forward price valuation

Collected data is implemented in equation 4, providing an assessment of prospective forward prices for amine, glyphosate and paraquat. These are depicted in Appendix 2. We considered a LIBOR rate of 1.24% (APR), a convenience yield of 0.55% (APR), and a maturity of 90 days. Additionally, this appendix describes quantity, product cost and per litre per item prices of products.

### DISCUSSION

Considering that agrochemical supply prices are an exogenous, non-controllable primordial input, whose price volatility affects the profitability of agricultural producers in both short and long term, they might benefit greatly from a financial derivative that allows them to be protected from sharp price fluctuations.

The spot and forward prices exhibited in Appendix 2 show the plausible profits or losses according to the financial position held: long/short. For instance, an agent holding a long position (an agricultural producer) in the forward contract of amine experiences gains, since the forward price per litre was settled on 1 April 2013 as \$5.25, and whereas the actual spot price in July was \$5.40. If the forward price was \$5.30, this would represent savings worth \$3,944. Similarly, the holder of the forward of glyphosate, engaging in a long position, yields a profit since the spot price on 7 January 2016 was \$4.80, the forward price in January was \$4.86 and the spot price on 8 April 2013 was \$5; this entails savings of \$8,771.75. Finally, holding a long position in the case of paraquat results in a loss (\$7,087.43) for the holder of a long position, as the forward price was \$7.05 and the actual spot price on 10 April 2016 was \$6.90.

Engaging in this proposed hedging process allows agricultural producers to mitigate the uncertainty of market prices. Since the natural up- and down-swings in the spot market price creates uncertainty, a competitive advantage is derived for agents involved in this derivative instrument, resulting in savings (profits). All in all the market prices from Appendix 2 reveal a favourable position for the holder of the long position (the agricultural producer), since the forward price represents a solid advantage, making supplies acquisition cheaper than the actual purchase at spot prices. Furthermore, the cost of one of the most influential supplies and a primordial component of the prime cost becomes certain.

By guaranteeing a fixed cost in advance, producers may plan properly ahead of time, allowing them to have a clear view of costs, financial resource requirements and profitability. There are, however, ethical implications for the issuer of the derivative, as this agent may choose to 1. add a premium to the LIBOR rate to narrow down the difference between spot and forward prices, or 2. hoard and restrain the supply of the raw material to deliberately increase the price. To control these plausible anomalies objectively, it is highly recommended that agricultural and commercial governmental authorities monitor both spot and forward prices to guarantee transparency.

### CONCLUSION AND RECOMMENDATIONS

This paper aimed to prove the existing volatility in prices of agrochemical products and the viability of introducing those inputs into financial derivative markets. After the evaluation of the models to determine both premises, two conclusions arise. First, agrochemical products have been highly volatile over the years, and have a tendency to continue fluctuating in the future. Companies in the industry have experienced important downfalls due to this

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<sup>4</sup> Is determined using, NORMINV

uncertainty. Regarding the valuation of price volatility, it is advisable to expand the sample using daily data to other products to increase accuracy. Second, forward price valuation shows that, depending on the financial position chosen, agents have the possibility of obtaining economic benefits from the use of such contracts. Thus, it is feasible to use forward contracts as a hedging tool to diminish price uncertainty in agrochemicals. Therefore, due to its importance, in the future stock exchanges might offer these contracts to probable investors engaged in agrochemical activities and looking forward to plan ahead using a prestablished price.

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Appendix 1					
Glyphosate		Amine		Paraquat	
Date	Price	Date	Price	Date	Price
07/01/2013	4,80	04/01/2013	5,25	07/02/2012	6,50
09/01/2013	5,50	07/01/2013	4,70	21/03/2012	6,85
10/01/2013	5,20	07/01/2013	4,90	12/04/2012	6,50
21/01/2013	4,00	08/01/2013	5,13	20/04/2012	7,52
28/01/2013	3,80	10/01/2013	5,40	18/05/2012	7,52
29/01/2013	4,50	17/01/2013	5,00	07/06/2012	6,70
30/01/2013	3,75	18/01/2013	5,30	21/06/2012	7,52
06/02/2013	5,50	18/01/2013	5,60	12/07/2012	6,70
07/02/2013	4,80	21/01/2013	5,66	19/07/2012	7,53
08/02/2013	4,50	25/01/2013	4,00	08/08/2012	6,70
11/02/2013	4,00	28/01/2013	4,91	22/08/2012	7,53
12/02/2013	6,00	29/01/2013	4,93	10/10/2012	6,85
19/02/2013	5,00	30/01/2013	4,00	28/12/2012	7,53
20/02/2013	4,50	31/01/2013	5,25	02/01/2013	7,00
21/02/2013	4,50	04/02/2013	5,25	04/01/2013	7,93
25/02/2013	3,75	05/02/2013	5,13	10/01/2013	7,20
26/02/2013	4,50	08/02/2013	5,00	14/01/2013	6,80
28/02/2013	5,46	11/02/2013	4,50	15/01/2013	7,00
01/03/2013	5,80	18/02/2013	5,49	17/01/2013	7,70
11/03/2013	5,00	19/02/2013	5,45	21/01/2013	5,00
15/03/2013	5,90	21/02/2013	5,00	23/01/2013	6,70
18/03/2013	4,25	25/02/2013	4,92	28/01/2013	5,50
19/03/2013	5,50	26/02/2013	4,97	04/02/2013	6,50
25/03/2013	4,75	27/02/2013	4,00	08/02/2013	6,50
26/03/2013	4,50	28/02/2013	5,25	12/02/2013	7,10
27/03/2013	5,00	01/03/2013	6,00	13/02/2013	7,00
28/03/2013	5,46	05/03/2013	5,13	15/02/2013	6,85
02/04/2013	4,50	07/03/2013	5,00	21/02/2013	6,90
08/04/2013	5,00	08/03/2013	4,80	22/02/2013	7,00
15/04/2013	4,25	14/03/2013	5,25	25/02/2013	6,85
16/04/2013	5,90	15/03/2013	6,40	26/02/2013	6,86
17/04/2013	5,50	18/03/2013	5,17	28/02/2013	7,93
18/04/2013	4,20	21/03/2013	5,60	06/03/2013	7,93
22/04/2013	5,00	22/03/2013	5,00	11/03/2013	6,90
23/04/2013	4,00	26/03/2013	4,93	14/03/2013	6,50
25/04/2013	5,46	28/03/2013	4,98	15/03/2013	4,50
26/04/2013	3,80	29/03/2013	5,25	18/03/2013	7,40
29/04/2013	6,00	03/04/2013	4,50	19/03/2013	7,00
02/05/2013	6,10	04/04/2013	5,40	20/03/2013	7,10
06/05/2013	5,20	05/04/2013	7,20	21/03/2013	6,85
09/05/2013	4,75	08/04/2013	5,25	22/03/2013	6,85
17/05/2013	4,50	10/04/2013	4,88	25/03/2013	6,85
20/05/2013	4,75	12/04/2013	5,00	28/03/2013	7,00
23/05/2013	5,00	16/04/2013	6,40	10/04/2013	6,90

27/05/2013	4,90	18/04/2013	5,13	12/04/2013	6,25
28/05/2013	5,50	19/04/2013	4,75	15/04/2013	7,50
29/05/2013	4,50	22/04/2013	5,80	16/04/2013	7,80
30/05/2013	5,46	23/04/2013	4,93	17/04/2013	7,00
03/06/2013	4,80	24/04/2013	5,30	18/04/2013	6,90
05/06/2013	5,00	26/04/2013	5,28	22/04/2013	6,85
17/06/2013	5,00	29/04/2013	4,75	23/04/2013	6,85
20/06/2013	6,05	02/05/2013	5,60	26/04/2013	7,93
24/06/2013	5,00	06/05/2013	5,25	30/04/2013	6,80
25/06/2013	4,90	07/05/2013	8,03	01/05/2013	7,40
26/06/2013	4,75	08/05/2013	6,00	08/05/2013	6,90
27/06/2013	5,46	17/05/2013	5,51	09/05/2013	7,00
28/06/2013	6,00	22/05/2013	5,20	17/05/2013	5,00
01/07/2013	6,00	23/05/2013	5,00	20/05/2013	7,10
03/07/2013	4,50	27/05/2013	4,45	21/05/2013	8,50
05/07/2013	4,90	29/05/2013	4,87	22/05/2013	7,00
12/07/2013	4,75	30/05/2013	5,15	23/05/2013	6,85
15/07/2013	6,50	05/06/2013	5,60	27/05/2013	7,00
19/07/2013	5,90	06/06/2013	5,50	28/05/2013	7,93
22/07/2013	5,00	11/06/2013	7,72	30/05/2013	7,70
25/07/2013	5,50	17/06/2013	5,61	05/06/2013	7,00
26/07/2013	5,00	18/06/2013	6,75	11/06/2013	7,00
29/07/2013	6,00	19/06/2013	5,75	12/06/2013	7,00
31/07/2013	4,75	21/06/2013	5,25	14/06/2013	7,20
01/08/2013	5,00	24/06/2013	4,50	19/06/2013	7,93
05/08/2013	6,00	25/06/2013	4,83	20/06/2013	7,25
08/08/2013	5,20	26/06/2013	4,43	24/06/2013	7,00
15/08/2013	5,00	28/06/2013	4,75	25/06/2013	7,00
16/08/2013	4,95	04/07/2013	5,75	27/06/2013	6,85
19/08/2013	5,00	11/07/2013	5,51	28/06/2013	7,93
21/08/2013	6,00	15/07/2013	6,50	03/07/2013	7,00
22/08/2013	5,50	16/07/2013	6,38	04/07/2013	7,50
26/08/2013	5,00	17/07/2013	5,20	05/07/2013	7,20
27/08/2013	4,90	18/07/2013	6,50	09/07/2013	7,20
28/08/2013	5,00	19/07/2013	5,00	15/07/2013	7,25
29/08/2013	6,50	22/07/2013	5,25	16/07/2013	7,00
04/09/2013	5,50	25/07/2013	4,40	22/07/2013	6,50
10/09/2013	5,20	26/07/2013	4,75	23/07/2013	7,20
12/09/2013	5,25	30/07/2013	4,25	25/07/2013	7,93
17/09/2013	4,95	31/07/2013	5,12	30/07/2013	6,00
18/09/2013	6,30	01/08/2013	5,00	01/08/2013	6,75
20/09/2013	5,50	05/08/2013	4,75	05/08/2013	7,00
23/09/2013	4,75	06/08/2013	5,75	14/08/2013	7,20
25/09/2013	6,00	07/08/2013	7,00	16/08/2013	4,50
27/09/2013	4,90	09/08/2013	6,00	21/08/2013	7,20
30/09/2013	4,85	14/08/2013	5,24	22/08/2013	7,93
02/10/2013	5,00	15/08/2013	5,00	23/08/2013	8,95

03/10/2013	4,80	16/08/2013	5,18	27/08/2013	7,60
04/10/2013	5,00	20/08/2013	6,26	28/08/2013	5,50
08/10/2013	6,00	21/08/2013	5,50	29/08/2013	7,93
09/10/2013	5,90	22/08/2013	5,25	03/09/2013	7,00
10/10/2013	6,00	23/08/2013	4,50	11/09/2013	7,60
11/10/2013	5,00	26/08/2013	4,50	12/09/2013	6,00
14/10/2013	5,20	27/08/2013	4,45	17/09/2013	7,60
15/10/2013	6,50	28/08/2013	4,95	19/09/2013	6,00
17/10/2013	5,00	29/08/2013	4,97	24/09/2013	7,60
22/10/2013	4,75	02/09/2013	4,50	25/09/2013	7,00
23/10/2013	5,50	03/09/2013	5,50	26/09/2013	7,90
24/10/2013	6,50	04/09/2013	6,00	02/10/2013	7,10
25/10/2013	5,50	09/09/2013	5,25	08/10/2013	6,60
30/10/2013	6,50	10/09/2013	5,00	09/10/2013	7,60
31/10/2013	4,45	11/09/2013	5,00	11/10/2013	4,50
01/11/2013	4,80	12/09/2013	4,50	15/10/2013	8,95
04/11/2013	5,00	13/09/2013	8,11	17/10/2013	7,50
05/11/2013	6,00	17/09/2013	5,49	18/10/2013	7,60
08/11/2013	4,50	18/09/2013	5,69	22/10/2013	6,25
11/11/2013	5,50	19/09/2013	4,50	23/10/2013	7,90
12/11/2013	5,20	20/09/2013	5,42	24/10/2013	7,60
13/11/2013	6,50	25/09/2013	5,00	30/10/2013	8,00
14/11/2013	6,00	26/09/2013	6,12	31/10/2013	7,60
15/11/2013	7,00	30/09/2013	4,63	01/11/2013	7,60
18/11/2013	7,00	02/10/2013	5,38	05/11/2013	7,00
19/11/2013	5,25	03/10/2013	5,00	07/11/2013	7,60
20/11/2013	4,90	07/10/2013	5,40	13/11/2013	8,95
21/11/2013	6,50	08/10/2013	5,50	14/11/2013	7,60
22/11/2013	6,00	09/10/2013	6,25	15/11/2013	6,50
25/11/2013	7,50	10/10/2013	5,25	18/11/2013	6,75
29/11/2013	6,00	11/10/2013	4,50	21/11/2013	7,90
04/12/2013	5,00	14/10/2013	5,24	26/11/2013	8,00
10/12/2013	5,70	15/10/2013	5,80	28/11/2013	7,60
11/12/2013	5,30	16/10/2013	5,32	03/12/2013	7,60
16/12/2013	4,90	17/10/2013	4,50	04/12/2013	7,50
17/12/2013	6,00	18/10/2013	5,50	12/12/2013	7,00
19/12/2013	5,50	23/10/2013	5,32	13/12/2013	7,70
22/12/2013	6,10	24/10/2013	5,25	16/12/2013	6,35
23/12/2013	4,75	28/10/2013	5,90	17/12/2013	8,95
25/12/2013	6,00	29/10/2013	4,00	18/12/2013	6,75
27/12/2013	6,00	01/11/2013	5,40	20/12/2013	7,60
29/12/2013	6,00	05/11/2013	5,00	23/12/2013	6,25
06/01/2014	4,50	06/11/2013	5,44	24/12/2013	8,00
07/01/2014	18,50	07/11/2013	5,85	26/12/2013	7,90
09/01/2014	4,75	08/11/2013	5,25	02/01/2014	5,80
13/01/2014	6,00	12/11/2013	5,00	03/01/2014	5,80
14/01/2014	7,00	13/11/2013	5,88	07/01/2014	8,80

18/01/2014	6,75	15/11/2013	5,25	08/01/2014	7,50
21/01/2014	5,80	18/11/2013	5,21	10/01/2014	8,80
23/01/2014	4,50	19/11/2013	4,75	15/01/2014	7,60
24/01/2014	7,50	20/11/2013	4,81	16/01/2014	8,95
31/01/2014	5,00	21/11/2013	5,25	17/01/2014	7,60
04/02/2014	4,45	22/11/2013	5,50	20/01/2014	7,60
08/02/2014	5,00	25/11/2013	5,90	21/01/2014	7,60
10/02/2014	6,80	02/12/2013	5,00	22/01/2014	7,60
12/02/2014	5,00	05/12/2013	5,29	23/01/2014	8,80
17/02/2014	6,30	11/12/2013	5,51	24/01/2014	7,40
20/02/2014	4,50	12/12/2013	5,25	27/01/2014	7,21
25/02/2014	18,50	16/12/2013	4,99	28/01/2014	6,80
27/02/2014	5,00	17/12/2013	5,00	29/01/2014	7,00
28/02/2014	5,00	19/12/2013	5,48	30/01/2014	5,80
05/03/2014	5,50	20/12/2013	5,50	31/01/2014	7,00
06/03/2014	7,00	27/12/2013	5,50	03/02/2014	8,00
07/03/2014	4,50	31/12/2013	5,33	04/02/2014	5,80
12/03/2014	6,00	06/01/2014	4,50	05/02/2014	7,50
17/03/2014	4,85	07/01/2014	5,90	07/02/2014	8,00
18/03/2014	5,00	08/01/2014	5,00	08/02/2014	6,50
19/03/2014	6,30	09/01/2014	5,25	10/02/2014	7,60
20/03/2014	5,80	10/01/2014	5,25	12/02/2014	5,50
27/03/2014	5,50	16/01/2014	4,90	13/02/2014	7,60
29/03/2014	7,50	17/01/2014	5,25	14/02/2014	6,70
30/03/2014	6,00	20/01/2014	5,08	17/02/2014	7,60
02/04/2014	5,85	21/01/2014	5,75	18/02/2014	5,80
03/04/2014	6,50	23/01/2014	5,00	19/02/2014	8,80
04/04/2014	5,25	24/01/2014	5,50	21/02/2014	7,60
09/04/2014	6,00	27/01/2014	5,33	24/02/2014	7,40
10/04/2014	6,50	28/01/2014	5,85	25/02/2014	5,80
12/04/2014	5,70	29/01/2014	5,50	26/02/2014	7,21
14/04/2014	6,30	31/01/2014	5,03	27/02/2014	8,00
15/04/2014	5,20	05/02/2014	5,13	28/02/2014	8,00
16/04/2014	6,30	07/02/2014	5,25	04/03/2014	7,60
17/04/2014	6,50	08/02/2014	5,08	05/03/2014	7,60
18/04/2014	5,75	11/02/2014	5,40	06/03/2014	8,00
24/04/2014	5,50	12/02/2014	5,50	07/03/2014	7,50
28/04/2014	6,50	14/02/2014	4,92	11/03/2014	8,00
29/04/2014	6,00	18/02/2014	5,95	12/03/2014	7,60
30/04/2014	4,45	21/02/2014	5,30	13/03/2014	7,50
01/05/2014	5,25	24/02/2014	5,25	14/03/2014	7,60
02/05/2014	6,50	26/02/2014	4,80	17/03/2014	7,60
04/05/2014	5,80	27/02/2014	4,56	18/03/2014	7,60
05/05/2014	5,50	28/02/2014	5,68	19/03/2014	8,80
06/05/2014	5,00	17/03/2014	4,78	20/03/2014	8,52
07/05/2014	6,00	18/03/2014	5,00	21/03/2014	8,80
09/05/2014	5,75	19/03/2014	6,00	26/03/2014	7,50



12/05/2014	7,60	20/03/2014	5,50	28/03/2014	7,21
13/05/2014	6,25	24/03/2014	4,50	29/03/2014	8,00
14/05/2014	4,30	25/03/2014	5,70	31/03/2014	7,60
15/05/2014	6,30	26/03/2014	5,19	02/04/2014	8,55
19/05/2014	5,00	27/03/2014	6,63	03/04/2014	8,00
20/05/2014	4,50	28/03/2014	5,19	04/04/2014	7,60
21/05/2014	5,25	29/03/2014	6,50	08/04/2014	8,80
22/05/2014	5,50	30/03/2014	6,40	09/04/2014	7,60
23/05/2014	5,75	31/03/2014	6,00	10/04/2014	8,00
27/05/2014	5,25	02/04/2014	5,00	12/04/2014	8,50
29/05/2014	7,40	03/04/2014	7,50	14/04/2014	7,60
30/05/2014	5,75	04/04/2014	4,67	15/04/2014	7,70
02/06/2014	6,50	08/04/2014	4,50	16/04/2014	8,80
03/06/2014	6,00	09/04/2014	7,20	17/04/2014	8,00
05/06/2014	5,00	10/04/2014	5,90	18/04/2014	8,50
09/06/2014	7,00	11/04/2014	5,64	21/04/2014	7,60
10/06/2014	5,50	12/04/2014	4,60	22/04/2014	7,60
11/06/2014	6,00	14/04/2014	5,88	23/04/2014	7,50
13/06/2014	5,75	15/04/2014	5,00	25/04/2014	7,21
16/06/2014	4,00	16/04/2014	4,92	28/04/2014	7,60
18/06/2014	6,00	18/04/2014	6,00	29/04/2014	7,60
20/06/2014	5,75	23/04/2014	5,06	30/04/2014	7,80
23/06/2014	7,00	24/04/2014	4,78	02/05/2014	8,00
27/06/2014	5,75	25/04/2014	5,40	04/05/2014	8,50
30/06/2014	6,50	28/04/2014	7,91	05/05/2014	8,80
01/07/2014	5,50	03/05/2014	4,50	06/05/2014	7,60
02/07/2014	5,50	05/05/2014	5,75	07/05/2014	7,60
03/07/2014	6,00	06/05/2014	5,40	08/05/2014	7,60
04/07/2014	5,00	09/05/2014	5,33	09/05/2014	8,50
07/07/2014	7,00	13/05/2014	5,25	12/05/2014	8,50
08/07/2014	5,25	14/05/2014	4,75	13/05/2014	7,25
10/07/2014	6,50	15/05/2014	7,20	14/05/2014	7,60
11/07/2014	5,75	21/05/2014	5,88	15/05/2014	8,00
14/07/2014	4,50	22/05/2014	5,00	16/05/2014	8,80
16/07/2014	5,25	23/05/2014	5,83	19/05/2014	7,60
17/07/2014	5,00	26/05/2014	5,00	20/05/2014	7,60
21/07/2014	4,75	27/05/2014	5,88	21/05/2014	8,00
24/07/2014	6,50	28/05/2014	5,25	23/05/2014	8,50
28/07/2014	4,75	29/05/2014	5,40	24/05/2014	7,50
29/07/2014	6,50	02/06/2014	5,50	26/05/2014	7,21
30/07/2014	5,00	03/06/2014	5,00	27/05/2014	7,60
01/08/2014	6,30	04/06/2014	4,97	28/05/2014	7,50
05/08/2014	5,25	06/06/2014	5,80	29/05/2014	8,80
06/08/2014	7,00	09/06/2014	5,50	30/05/2014	8,50
07/08/2014	5,30	10/06/2014	5,67	31/05/2014	9,80
08/08/2014	6,50	11/06/2014	4,88	02/06/2014	8,00
12/08/2014	6,00	12/06/2014	5,80	03/06/2014	8,00

13/08/2014	5,25	16/06/2014	5,25	04/06/2014	7,60
14/08/2014	5,50	17/06/2014	5,60	05/06/2014	7,60
15/08/2014	6,50	18/06/2014	5,50	06/06/2014	8,80
16/08/2014	6,50	19/06/2014	8,05	09/06/2014	8,00
17/08/2014	6,50	20/06/2014	4,75	10/06/2014	8,00
18/08/2014	7,00	23/06/2014	5,50	11/06/2014	7,60
19/08/2014	6,00	24/06/2014	5,44	13/06/2014	8,50
21/08/2014	6,50	25/06/2014	5,38	16/06/2014	8,00
25/08/2014	4,50	27/06/2014	5,36	17/06/2014	7,90
29/08/2014	5,50	30/06/2014	5,50	18/06/2014	7,60
01/09/2014	7,00	02/07/2014	5,40	19/06/2014	8,80
03/09/2014	6,00	03/07/2014	5,00	20/06/2014	8,50
04/09/2014	5,00	04/07/2014	5,68	23/06/2014	8,00
05/09/2014	4,90	07/07/2014	5,25	24/06/2014	7,21
08/09/2014	5,00	08/07/2014	6,00	25/06/2014	7,50
09/09/2014	5,50	10/07/2014	5,87	27/06/2014	8,50
11/09/2014	5,50	11/07/2014	6,16	30/06/2014	8,00
15/09/2014	7,00	13/07/2014	5,63	02/07/2014	7,60
16/09/2014	5,50	14/07/2014	5,38	03/07/2014	7,50
19/09/2014	7,00	15/07/2014	5,63	04/07/2014	8,50
22/09/2014	6,50	16/07/2014	5,75	07/07/2014	8,00
23/09/2014	5,25	17/07/2014	5,13	09/07/2014	8,00
24/09/2014	5,50	18/07/2014	6,41	10/07/2014	8,80
25/09/2014	7,00	21/07/2014	5,00	11/07/2014	8,50
29/09/2014	4,60	22/07/2014	5,63	14/07/2014	8,00
01/10/2014	6,31	23/07/2014	4,75	15/07/2014	8,00
02/10/2014	6,00	25/07/2014	6,30	16/07/2014	8,00
03/10/2014	7,00	28/07/2014	5,25	18/07/2014	8,00
07/10/2014	7,55	29/07/2014	5,41	20/07/2014	8,00
08/10/2014	6,38	30/07/2014	5,00	21/07/2014	7,88
09/10/2014	6,50	31/07/2014	5,43	22/07/2014	8,00
10/10/2014	5,50	01/08/2014	6,00	24/07/2014	7,80
14/10/2014	5,50	04/08/2014	5,90	25/07/2014	8,00
15/10/2014	7,00	05/08/2014	5,00	28/07/2014	7,88
16/10/2014	6,31	06/08/2014	5,50	29/07/2014	9,00
17/10/2014	4,80	07/08/2014	5,70	30/07/2014	9,00
20/10/2014	7,00	08/08/2014	5,75	01/08/2014	8,50
21/10/2014	7,00	11/08/2014	5,38	04/08/2014	8,00
22/10/2014	6,50	12/08/2014	5,40	05/08/2014	8,00
23/10/2014	5,00	14/08/2014	5,50	06/08/2014	8,00
27/10/2014	7,00	15/08/2014	5,56	07/08/2014	9,50
28/10/2014	4,60	16/08/2014	5,40	08/08/2014	8,00
29/10/2014	5,50	17/08/2014	5,40	11/08/2014	8,80
30/10/2014	6,31	18/08/2014	5,50	12/08/2014	8,00
31/10/2014	4,75	19/08/2014	5,08	13/08/2014	8,00
03/11/2014	7,00	21/08/2014	5,34	15/08/2014	8,00
04/11/2014	6,57	22/08/2014	5,40	18/08/2014	8,00

05/11/2014	5,50	25/08/2014	5,58	19/08/2014	8,00
06/11/2014	6,38	26/08/2014	5,35	20/08/2014	7,21
07/11/2014	5,45	27/08/2014	5,00	21/08/2014	7,80
10/11/2014	7,00	28/08/2014	7,00	22/08/2014	7,50
11/11/2014	5,00	29/08/2014	6,25	25/08/2014	8,50
13/11/2014	7,00	01/09/2014	5,72	26/08/2014	7,50
17/11/2014	5,00	02/09/2014	6,25	27/08/2014	7,21
18/11/2014	4,60	04/09/2014	5,68	28/08/2014	7,50
19/11/2014	5,50	05/09/2014	14,23	29/08/2014	7,60
20/11/2014	6,00	08/09/2014	5,36	31/08/2014	8,00
21/11/2014	6,50	09/09/2014	5,88	01/09/2014	8,50
24/11/2014	7,00	10/09/2014	5,00	02/09/2014	8,00
25/11/2014	4,30	12/09/2014	5,16	03/09/2014	8,00
27/11/2014	5,00	15/09/2014	5,54	04/09/2014	9,00
28/11/2014	5,50	16/09/2014	5,00	05/09/2014	7,50
01/12/2014	5,90	18/09/2014	5,00	06/09/2014	8,00
02/12/2014	5,90	19/09/2014	5,54	08/09/2014	8,50
03/12/2014	5,45	22/09/2014	5,45	09/09/2014	7,88
04/12/2014	6,38	24/09/2014	5,28	10/09/2014	8,00
05/12/2014	6,31	25/09/2014	5,00	11/09/2014	8,00
08/12/2014	5,00	26/09/2014	5,66	12/09/2014	8,80
09/12/2014	7,00	29/09/2014	5,64	15/09/2014	8,50
10/12/2014	5,00	30/09/2014	5,50	16/09/2014	7,60
11/12/2014	5,00	02/10/2014	5,34	17/09/2014	8,50
12/12/2014	6,31	03/10/2014	5,00	18/09/2014	8,00
15/12/2014	6,38	06/10/2014	5,66	19/09/2014	7,88
16/12/2014	5,50	07/10/2014	5,25	20/09/2014	8,00
17/12/2014	7,00	08/10/2014	5,25	22/09/2014	8,50
18/12/2014	5,50	09/10/2014	4,88	23/09/2014	8,30
19/12/2014	5,00	10/10/2014	5,00	24/09/2014	8,80
20/12/2014	6,31	13/10/2014	5,72	25/09/2014	8,00
24/12/2014	6,00	14/10/2014	5,08	26/09/2014	8,00
26/12/2014	6,31	15/10/2014	5,00	29/09/2014	8,50
29/12/2014	5,00	16/10/2014	5,64	30/09/2014	8,00
30/12/2014	5,00	17/10/2014	5,45	01/10/2014	7,88
02/01/2015	5,00	20/10/2014	5,58	02/10/2014	8,00
05/01/2015	7,00	21/10/2014	5,00	03/10/2014	8,00
06/01/2015	4,25	22/10/2014	6,00	06/10/2014	8,80
08/01/2015	5,00	23/10/2014	4,80	07/10/2014	8,00
09/01/2015	5,00	24/10/2014	5,08	08/10/2014	7,88
12/01/2015	5,50	27/10/2014	5,48	09/10/2014	8,00
13/01/2015	6,40	28/10/2014	5,20	13/10/2014	8,50
16/01/2015	6,31	30/10/2014	5,40	14/10/2014	8,00
17/01/2015	4,50	31/10/2014	5,00	15/10/2014	8,00
21/01/2015	4,50	03/11/2014	5,50	16/10/2014	7,88
22/01/2015	6,80	04/11/2014	5,88	17/10/2014	8,00
23/01/2015	5,00	05/11/2014	5,00	20/10/2014	8,50

26/01/2015	6,80	06/11/2014	5,54	21/10/2014	7,60
27/01/2015	4,50	07/11/2014	5,00	22/10/2014	9,00
28/01/2015	5,00	10/11/2014	5,50	23/10/2014	8,00
29/01/2015	6,00	11/11/2014	5,33	24/10/2014	8,80
02/02/2015	7,00	13/11/2014	5,00	27/10/2014	8,50
03/02/2015	5,90	14/11/2014	5,25	28/10/2014	9,00
04/02/2015	4,20	17/11/2014	5,10	29/10/2014	8,00
06/02/2015	6,10	18/11/2014	5,78	30/10/2014	7,88
08/02/2015	7,20	19/11/2014	5,40	31/10/2014	7,60
09/02/2015	4,50	20/11/2014	5,30	01/11/2014	8,00
11/02/2015	6,00	21/11/2014	5,25	03/11/2014	8,50
12/02/2015	5,00	24/11/2014	5,19	04/11/2014	8,00
13/02/2015	6,40	25/11/2014	5,00	06/11/2014	8,00
16/02/2015	7,00	26/11/2014	5,00	07/11/2014	8,00
17/02/2015	5,90	28/11/2014	5,13	10/11/2014	8,50
19/02/2015	6,00	01/12/2014	5,79	11/11/2014	9,00
20/02/2015	6,80	02/12/2014	6,00	12/11/2014	8,00
21/02/2015	5,60	03/12/2014	5,58	13/11/2014	7,50
23/02/2015	4,50	04/12/2014	5,08	14/11/2014	7,88
24/02/2015	7,50	05/12/2014	5,00	17/11/2014	6,00
25/02/2015	5,00	08/12/2014	5,72	18/11/2014	5,80
26/02/2015	6,80	09/12/2014	5,00	19/11/2014	8,00
28/02/2015	5,60	10/12/2014	5,00	20/11/2014	8,00
02/03/2015	7,50	11/12/2014	5,69	21/11/2014	7,88
03/03/2015	5,90	12/12/2014	5,00	24/11/2014	8,50
05/03/2015	5,50	15/12/2014	5,88	25/11/2014	6,00
06/03/2015	5,60	16/12/2014	5,00	26/11/2014	8,80
09/03/2015	5,00	18/12/2014	5,40	27/11/2014	6,00
11/03/2015	5,00	19/12/2014	4,50	28/11/2014	8,00
12/03/2015	6,80	20/12/2014	5,00	01/12/2014	7,80
13/03/2015	5,60	22/12/2014	5,83	02/12/2014	7,80
16/03/2015	7,50	23/12/2014	5,45	03/12/2014	8,00
17/03/2015	5,90	24/12/2014	5,17	04/12/2014	8,00
19/03/2015	5,00	26/12/2014	5,13	05/12/2014	7,88
20/03/2015	5,00	29/12/2014	5,58	06/12/2014	8,00
25/03/2015	4,00	30/12/2014	5,40	08/12/2014	9,00
27/03/2015	5,00	31/12/2014	7,50	10/12/2014	8,80
30/03/2015	4,50	02/01/2015	5,00	11/12/2014	6,00
01/04/2015	5,00	05/01/2015	5,88	12/12/2014	7,88
05/04/2015	6,00	07/01/2015	5,00	13/12/2014	8,00
06/04/2015	5,00	08/01/2015	5,20	15/12/2014	8,00
07/04/2015	5,00	09/01/2015	5,00	16/12/2014	8,00
08/04/2015	5,00	12/01/2015	5,41	17/12/2014	8,00
14/04/2015	4,50	14/01/2015	5,00	18/12/2014	8,00
16/04/2015	6,00	15/01/2015	5,88	19/12/2014	8,00
22/04/2015	5,00	16/01/2015	5,08	20/12/2014	7,88
25/04/2015	5,50	19/01/2015	5,13	22/12/2014	7,50

27/04/2015	5,00	20/01/2015	4,50	23/12/2014	8,80
28/04/2015	5,90	21/01/2015	4,50	24/12/2014	8,00
29/04/2015	5,00	23/01/2015	5,55	26/12/2014	7,88
01/05/2015	5,65	27/01/2015	5,20	29/12/2014	6,00
04/05/2015	5,00	28/01/2015	5,00	30/12/2014	7,25
05/05/2015	5,00	29/01/2015	5,25	31/12/2014	7,50
06/05/2015	5,00	30/01/2015	6,25	02/01/2015	8,00
11/05/2015	7,50	31/01/2015	5,00	05/01/2015	8,50
13/05/2015	5,00	02/02/2015	5,25	06/01/2015	8,00
18/05/2015	7,50	03/02/2015	4,70	07/01/2015	8,00
19/05/2015	5,97	04/02/2015	5,38	08/01/2015	8,00
20/05/2015	5,00	06/02/2015	5,13	09/01/2015	6,00
26/05/2015	4,80	11/02/2015	4,50	10/01/2015	8,00
27/05/2015	6,00	12/02/2015	4,77	12/01/2015	8,00
01/06/2015	7,50	13/02/2015	5,00	13/01/2015	5,80
02/06/2015	5,50	18/02/2015	5,70	14/01/2015	8,00
03/06/2015	5,00	21/02/2015	4,87	15/01/2015	6,90
08/06/2015	5,00	23/02/2015	4,83	16/01/2015	7,88
09/06/2015	6,00	25/02/2015	5,83	17/01/2015	7,50
12/06/2015	5,00	27/02/2015	5,00	19/01/2015	7,80
15/06/2015	4,80	28/02/2015	5,00	20/01/2015	7,50
17/06/2015	7,50	01/03/2015	6,72	21/01/2015	8,00
18/06/2015	5,00	02/03/2015	5,50	22/01/2015	7,88
22/06/2015	7,50	03/03/2015	5,83	23/01/2015	8,00
23/06/2015	4,80	06/03/2015	4,75	26/01/2015	5,80
29/06/2015	7,50	12/03/2015	5,23	27/01/2015	8,00
06/07/2015	5,45	13/03/2015	5,00	28/01/2015	8,00
07/07/2015	5,90	19/03/2015	5,00	29/01/2015	8,00
08/07/2015	4,80	20/03/2015	5,00	30/01/2015	6,00
10/07/2015	6,00	23/03/2015	5,32	02/02/2015	8,00
11/07/2015	5,00	26/03/2015	5,50	03/02/2015	7,80
13/07/2015	7,50	27/03/2015	5,13	04/02/2015	8,00
15/07/2015	7,00	30/03/2015	5,83	05/02/2015	8,00
16/07/2015	5,50	31/03/2015	5,25	06/02/2015	8,00
20/07/2015	7,50	03/04/2015	5,00	09/02/2015	5,80
21/07/2015	4,50	06/04/2015	5,25	10/02/2015	8,00
22/07/2015	5,50	09/04/2015	5,41	11/02/2015	8,00
24/07/2015	5,00	10/04/2015	5,20	12/02/2015	6,00
28/07/2015	5,00	13/04/2015	5,68	13/02/2015	8,00
30/07/2015	5,00	16/04/2015	5,00	16/02/2015	8,00
03/08/2015	5,00	17/04/2015	5,34	17/02/2015	7,80
04/08/2015	4,20	22/04/2015	5,55	18/02/2015	8,00
05/08/2015	5,50	24/04/2015	5,16	19/02/2015	8,00
07/08/2015	5,80	25/04/2015	5,00	20/02/2015	8,00
10/08/2015	5,90	27/04/2015	5,41	21/02/2015	7,70
11/08/2015	3,95	28/04/2015	5,15	23/02/2015	8,00
12/08/2015	4,50	29/04/2015	5,61	24/02/2015	8,50

17/08/2015	5,50	30/04/2015	4,50	25/02/2015	8,00
19/08/2015	5,00	01/05/2015	5,00	26/02/2015	7,80
20/08/2015	5,00	06/05/2015	5,83	27/02/2015	7,80
24/08/2015	5,50	07/05/2015	5,25	28/02/2015	7,70
25/08/2015	5,60	08/05/2015	5,01	01/03/2015	8,00
26/08/2015	6,00	12/05/2015	4,40	02/03/2015	8,00
27/08/2015	5,00	13/05/2015	5,00	03/03/2015	7,80
31/08/2015	5,50	14/05/2015	4,75	05/03/2015	7,25
01/09/2015	4,50	15/05/2015	5,00	06/03/2015	8,00
03/09/2015	5,80	18/05/2015	5,50	09/03/2015	8,00
		19/05/2015	6,00	10/03/2015	8,00
		20/05/2015	5,60	11/03/2015	9,00
		25/05/2015	5,16	12/03/2015	8,00
		26/05/2015	4,90	13/03/2015	7,70
		27/05/2015	5,78	16/03/2015	8,00
		29/05/2015	5,00	17/03/2015	8,00
		03/06/2015	5,17	18/03/2015	8,00
		04/06/2015	5,36	19/03/2015	8,00
		08/06/2015	5,00	20/03/2015	9,00
		09/06/2015	5,80	23/03/2015	5,80
		10/06/2015	5,55	24/03/2015	6,90
		11/06/2015	4,88	25/03/2015	7,50
		15/06/2015	5,00	26/03/2015	6,00
		16/06/2015	5,08	27/03/2015	9,00
		18/06/2015	4,50	28/03/2015	8,00
		19/06/2015	4,40	29/03/2015	8,00
		22/06/2015	5,00	30/03/2015	5,80
		24/06/2015	5,38	31/03/2015	6,90
		25/06/2015	5,26	01/04/2015	8,00
		29/06/2015	5,00	02/04/2015	7,80
		30/06/2015	5,00	06/04/2015	8,00
		03/07/2015	5,33	07/04/2015	8,00
		06/07/2015	5,25	08/04/2015	6,00
		07/07/2015	5,00	09/04/2015	7,80
		08/07/2015	5,00	10/04/2015	5,00
		11/07/2015	5,00	13/04/2015	8,00
		14/07/2015	5,16	14/04/2015	5,80
		16/07/2015	5,50	15/04/2015	8,00
		22/07/2015	5,70	16/04/2015	8,00
		29/07/2015	4,50	17/04/2015	7,80
		31/07/2015	5,20	20/04/2015	8,00
		03/08/2015	5,50	21/04/2015	8,00
		12/08/2015	4,75	22/04/2015	8,50
		18/08/2015	5,20	23/04/2015	6,00
		19/08/2015	5,50	24/04/2015	7,70
		20/08/2015	5,50	27/04/2015	6,00
		21/08/2015	5,50	28/04/2015	7,50

25/08/2015	5,67	29/04/2015	8,00
26/08/2015	5,00	30/04/2015	8,00
04/09/2015	5,04	01/05/2015	8,00
		04/05/2015	8,00
		05/05/2015	7,80
		06/05/2015	9,17
		07/05/2015	7,80
		08/05/2015	8,00
		11/05/2015	8,00
		12/05/2015	5,80
		13/05/2015	8,00
		14/05/2015	6,00
		15/05/2015	8,00
		18/05/2015	8,00
		20/05/2015	7,50
		21/05/2015	8,00
		22/05/2015	8,00
		25/05/2015	6,00
		26/05/2015	5,80
		27/05/2015	8,00
		28/05/2015	8,00
		29/05/2015	8,50
		01/06/2015	8,00
		02/06/2015	8,00
		03/06/2015	8,00
		04/06/2015	8,00
		05/06/2015	8,00
		08/06/2015	8,00
		10/06/2015	8,00
		11/06/2015	8,00
		12/06/2015	8,00
		15/06/2015	5,80
		17/06/2015	8,50
		18/06/2015	6,00
		19/06/2015	8,00
		22/06/2015	8,00
		23/06/2015	5,80
		24/06/2015	8,00
		25/06/2015	8,00
		26/06/2015	7,70
		28/06/2015	8,00
		29/06/2015	8,00
		30/06/2015	8,00
		03/07/2015	8,00
		06/07/2015	8,00
		07/07/2015	7,50
		08/07/2015	5,80

09/07/2015	8,00
10/07/2015	8,00
11/07/2015	8,00
12/07/2015	8,00
13/07/2015	8,00
15/07/2015	8,00
17/07/2015	6,00
20/07/2015	8,00
21/07/2015	6,80
22/07/2015	8,00
23/07/2015	6,00
24/07/2015	8,00
27/07/2015	7,50
28/07/2015	9,17
29/07/2015	8,25
30/07/2015	6,00
31/07/2015	7,45
03/08/2015	8,00
04/08/2015	7,80
05/08/2015	8,00
06/08/2015	6,90
07/08/2015	8,00
10/08/2015	7,50
11/08/2015	8,00
13/08/2015	8,00
14/08/2015	6,00
17/08/2015	8,00
18/08/2015	6,80
19/08/2015	8,00
20/08/2015	6,00
21/08/2015	8,00
24/08/2015	8,00
25/08/2015	8,50
26/08/2015	8,00
27/08/2015	8,00
28/08/2015	6,00
31/08/2015	8,00
01/09/2015	6,50
02/09/2015	8,00
03/09/2015	8,00
04/09/2015	7,45



**Appendix 2**

**Paraguay**

02/01/2013	04/01/2013	10/01/2013	14/01/2013	15/01/2013	17/01/2013	21/01/2013	23/01/2013	28/01/2013	04/02/2013
Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter
7,00	7,93	7,20	6,80	7,00	7,70	5,00	6,70	5,50	6,50
Spot Price	Spot Price	Spot Price	Spot Price	Spot Price	Spot Price	Spot Price	Spot Price	Spot Price	Spot Price
\$ 324.100,00	\$ 367.159,00	\$ 333.360,00	\$ 314.840,00	\$ 324.100,00	\$ 356.510,00	\$ 231.500,00	\$ 310.210,00	\$ 254.650,00	\$ 300.950,00

Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter
7,05	7,98	7,25	6,85	7,05	7,75	5,05	6,75	5,55	6,55
Forward Price	Forward Price	Forward Price	Forward Price	Forward Price	Forward Price	Forward Price	Forward Price	Forward Price	Forward Price
\$ 326.557,43	\$ 369.690,77	\$ 335.833,41	\$ 317.281,44	\$ 326.557,43	\$ 359.023,38	\$ 233.797,55	\$ 312.643,45	\$ 256.987,52	\$ 303.367,46

10/04/2013	12/04/2013	15/04/2013	16/04/2013	17/04/2013	18/04/2013	22/04/2013	23/04/2013	30/04/2013	08/05/2013
Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter	Price / liter
6,90	6,25	7,50	7,80	7,00	6,90	6,85	6,85	6,80	6,90
Spot Price	Spot Price	Spot Price	Spot Price	Spot Price	Spot Price	Spot Price	Spot Price	Spot Price	Spot Price
\$ 319.470,00	\$ 289.375,00	\$ 347.250,00	\$ 361.140,00	\$ 324.100,00	\$ 319.470,00	\$ 317.155,00	\$ 317.155,00	\$ 314.840,00	\$ 319.470,00
Gain/Loss	Gain/Loss	Gain/Loss	Gain/Loss	Gain/Loss	Gain/Loss	Gain/Loss	Gain/Loss	Gain/Loss	Gain/Loss
\$ (7.087,43)	\$ (80.315,77)	\$ 11.416,59	\$ 43.858,56	\$ (2.457,43)	\$ (39.553,38)	\$ 83.357,45	\$ 4.511,55	\$ 57.852,48	\$ 16.102,54

**Amine**

04/01/2013	07/01/2013	07/01/2013	08/01/2013	10/01/2013	17/01/2013	18/01/2013	18/01/2013	21/01/2013	25/01/2013
<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>
\$ 5,25	\$ 4,70	\$ 4,90	\$ 5,13	\$ 5,40	\$ 5,00	\$ 5,30	\$ 5,60	\$ 5,66	\$ 4,00
<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>
\$ 212.446,50	\$ 190.190,20	\$ 198.283,40	\$ 207.388,25	\$ 218.516,40	\$ 202.330,00	\$ 214.469,80	\$ 226.609,60	\$ 229.037,56	\$ 161.864,00

<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>
\$ 5,30	\$ 4,75	\$ 4,95	\$ 5,18	\$ 5,45	\$ 5,05	\$ 5,35	\$ 5,65	\$ 5,71	\$ 4,05
<b>Forward Price</b>	<b>Forward Price</b>	<b>Forward Price</b>	<b>Forward Price</b>	<b>Forward Price</b>	<b>Forward Price</b>	<b>Forward Price</b>	<b>Forward Price</b>	<b>Forward Price</b>	<b>Forward Price</b>
\$ 214.572,34	\$ 192.277,61	\$ 200.384,79	\$ 209.505,36	\$ 220.652,72	\$ 204.438,37	\$ 216.599,13	\$ 228.759,89	\$ 231.192,04	\$ 163.902,51

04/04/2013	08/04/2013	10/04/2013	12/04/2013	16/04/2013	18/04/2013	19/04/2013	22/04/2013	23/04/2013	26/04/2013
<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>	<b>Price / liter</b>
\$ 5,40	\$ 5,25	\$ 4,88	\$ 5,00	\$ 6,40	\$ 5,13	\$ 4,75	\$ 5,80	\$ 4,93	\$ 5,28
<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>	<b>Spot Price</b>
\$ 218.516,40	\$ 212.446,50	\$ 197.271,75	\$ 202.330,00	\$ 258.982,40	\$ 207.388,25	\$ 192.213,50	\$ 234.702,80	\$ 199.295,05	\$ 213.458,15
<b>Gain/Loss</b>	<b>Gain/Loss</b>	<b>Gain/Loss</b>	<b>Gain/Loss</b>	<b>Gain/Loss</b>	<b>Gain/Loss</b>	<b>Gain/Loss</b>	<b>Gain/Loss</b>	<b>Gain/Loss</b>	<b>Gain/Loss</b>
\$ 3.944,06	\$ 20.168,89	\$ (3.113,04)	\$ (7.175,36)	\$ 38.329,68	\$ 2.949,88	\$ (24.385,63)	\$ 5.942,91	\$ (31.896,99)	\$ 49.555,64