FACTORS INFLUENCING THE MOVEMENT OF COPPER PRICE ON LONDON METAL EXCHANGE

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Corporate Master in Business Administration
2010
FACTORS INFLUENCING THE MOVEMENT OF COPPER PRICE ON LONDON METAL EXCHANGE

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A dissertation submitted in partial fulfillment of the requirements for the degree of Corporate Master in Business Administration

Faculty of Economics and Business
UNIVERSITI MALAYSIA SARAWAK
2010
I certify that I have supervised and read this study and that in my opinion it conforms to acceptable standards of Scholarly presentation and is fully adequate, in scope and quality, as a research paper for the degree of Corporate Master in Business Administration.

Prof. Dr. Abu Hassan Md Isa
Supervisor

This research paper was submitted to the Faculty of Economics and Business, UNIMAS and is accepted as partial fulfillment of the requirements for the degree of Corporate Master in business Administration.

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Dean, Faculty of Economics and Business
UNIMAS
DECLARATION AND COPYRIGHT

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I hereby declare that this result of my own investigations, except where otherwise stated. Other sources are acknowledged by footnotes giving explicit references and a bibliography is appended.

Signature : [Signature]

Date : 26.07.10

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ACKNOWLEDGEMENTS

The researcher would first express her gratefulness and sincere appreciation to Project Supervisor, Prof. Dr. Abu Hassan Md Isa for spending his precious time in comments, advice, positive feedback and guidance, throughout the preparation of this Corporate Business Project.

I am sincerely thankful to my family members, especially my parents and friends for giving me support and encouragement throughout the duration of my study leading to the completion of this research.

Thank you very much to all of you.
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ABSTRACT

FACTORS INFLUENCING THE MOVEMENT OF COPPER PRICE ON LONDON METAL EXCHANGE

By

Ngang Mee Foong

(This research is to understand the factors influencing the movement of copper price on LME in order to increase the competitiveness, reduce the risk, and improve the project management and reduce the losses from price volatility.)

Three variables are (copper stock level, aluminium price, and exchange rate) being identified as the possible factors influencing the movement of copper price on LME. Theory of price formation of copper had determined the factors for the copper price formation. However, as this study focuses on how stock level, aluminium price (price of a substitute) and exchange rate influence the movement of copper LME price, it will use the inverse demand function of price formation of copper.

The results of the study showed that all of these factors affecting copper price on LME. However, exchange rate influences to the copper price are lesser when compared with copper stock level and aluminium price. Both of the copper stock level and aluminium price have a positive relationship to the copper price. However, exchange rate has a negative relationship to the copper price.

From the normalized cointegrating vector test, it showed that stock level and aluminium price is positively influence to the copper price. Real Effective exchange rate is however negatively influence to the copper price. The result is in line with the theory regarding price formation of copper \( Q_d = f (P, P_s, GDP, Exch. Rate) \) by Tilton.

In conclusion, the factors (copper stock level, aluminium price and exchange rate) that being identified in this study was found to have different degree of influence to copper LME price. By understanding the relationship of the factors with copper LME price, it could increase the competitiveness, reduce the risk, and improve the project management and reduce the losses from price volatility.
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CHAPTER 1
INTRODUCTION

1.0 Overview

Copper is one of the commodities that is traded on London Metal Exchange (LME), and it is known to be one of the most important and useful metals. The fluctuation of copper price would directly impact the economy. Hence to understand the factors influencing the movement of copper price on LME is important as it could increase the competitiveness, reduce the risk, improve the project management and reduce the losses due price volatility.

Copper is a ductile metal with very high thermal and electrical conductivity. Pure copper is rather soft and malleable, and a freshly-exposed surface has a pinkish or peachy color. It is used as a thermal conductor, an electrical conductor, a building material, and a constituent of various metal alloys. Copper metal and alloys have been used for thousands of years. There may be insufficient reserves to sustain current high rates of copper consumption. Some countries, such as Chile and the United States, still have sizable reserves of the metal which are extracted through large open pit mines.
Copper has a wide range of attributes which is why it has so many applications today. It was found to be a very efficient conductor of electricity and heat as well as being flexible, strong, durable and resistant to corrosion. As such it has been key to many of man's technological advances, the two biggest being telegraphic communications and electricity. But it is also widely used for heating, air conditioning, plumbing, roofing, brass fittings and for so much of the electrical environment we now take for granted: TV, radio, lighting, computers, mobile phones etc all require copper wiring, electrical leads, adapters, transformers and motors. Various copper compounds and chemicals are also used to protect plants and crops and to preserve wood. The breakdown of copper by use is as follows:

![Chart 1 Uses of Copper](image)

<table>
<thead>
<tr>
<th>Uses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport</td>
<td>7%</td>
</tr>
<tr>
<td>Engineering</td>
<td>24%</td>
</tr>
<tr>
<td>Electrical</td>
<td>17%</td>
</tr>
<tr>
<td>Building</td>
<td>48%</td>
</tr>
<tr>
<td>Other</td>
<td>4%</td>
</tr>
</tbody>
</table>

Chart 1 Uses of Copper
Between 1900 and 2000, copper demand grew from 500,000 tonnes to around 13,000,000 tonnes, with growth accelerating since the 1950's. With some many widespread uses it is not surprising copper demand keeps growing and now with China, India and many other developing countries starting to industrialize and urbanize, demand is likely to grow from strength to strength. Per capita demand for copper rises as GDP per capita rises. Japan consumes around 12kg per capita, North America consumers around 10kg per capita and Europe around 9kg per capita. The large populations of China, India, Eastern Europe and South America are all consuming less than 2kg per capita - this is a huge indicator of what lies ahead for copper demand.

Copper is not a particularly rare metal and it is produced in many countries, Chart 2 shows the geographical distribution of primary supply. Today copper supply is made up from two sources, the majority, 88%, comes from primary production, that new copper that is mined from the ground, but of growing importance is secondary supply which accounts for 12% of total refined copper supply. Secondary supply comes from recycling copper scrap.
Primary supply involves mining copper ores, which generally come in two forms, copper sup hides or copper oxides. Depending on the type of ore mined, the ore is processed by one of two methods. Copper sup hide ore is first concentrated then smelted and then refined; each of these stages is a separate process and can be carried out at a different location. Whereas copper oxide ore is crushed and the copper is then extracted from the crushed ore by dissolving the copper in acid and the collecting the copper from the acid via electrolysis. This process is called Solvent extraction-electrowinning, SXEW for short. SXEW accounts for some 15% of primary copper production. (Basemetals.com, 2000)

Copper is the second largest traded contract in LME. Buyer could purchase the copper at spot price, 3 months forward price, 15 months forward price and 27 months forward price.
The spot price of a commodity is the price that is quoted for immediate (spot) settlement (payment and delivery). Spot settlement is normally one or two business days from trade date. This is in contrast with the forward price established in a forward contract or futures contract, where contract terms (price) are set now, but delivery and payment will occur at a future date. For non-perishable commodity, the spot price reflects market expectations of future price movements. In theory, the difference in spot and forward prices should be equal to the finance charges, plus any earnings due to the holder of the security, according to the cost of carry model.

LME was established for over 130 years and located in the heart of The City of London, the London Metal Exchange is the world’s premier non-ferrous metals market. It offers a range of futures and options contracts for non-ferrous & minor metals, steel and plastics. The Exchange provides a transparent forum for all trading activity and as a result helps to ‘discover’ what the price of material will be months and years ahead. This helps the physical industry to plan forward in a world subject to often severe and rapid price movements. Such is the liquidity at the Exchange that the prices ‘discovered’ at the LME are recognized and relied upon by industry throughout the world.

The LME is a highly liquid market and in 2009 achieved volumes of 111.9 million lots, equivalent to $7.41 trillion annually and $29 billion on an average business day. Based in
London the LME is a global market with an international membership and with more than 95% of its business coming from overseas.

1.1 Problem Statement

Without knowing the factors influencing the movement of copper price on LME, the copper buyer could face the following problems:

a. *Less competitive in the market.* Some companies do a better job than others in protecting their margins from the ups and downs of commodity markets. Effective commodity management can be a source of competitive advantage as it can lower the average procurement cost, reduce the impact of price volatility on earnings, and consequently increase shareholder value. Agarwal, Marriott & Mussomeli (2007)

Without knowing the factors influencing the movement of copper price on LME, it would not effective in commodity management hence the organization would be less competitive in its industries.
b. *Price Risk management.* Businesses that rely on the purchase of commodities for their product or service can suffer from unexpected costs if commodity prices become volatile. Cheung (2010)

With the understanding of the factors influencing the movement of copper price on LME, it would assist businesses to manage their price risk more efficiently.

c. *Project management.* A successful project manager must simultaneously manage the four basic elements of a project: resources (people, equipment, material), time (task durations, dependencies, critical path), money (costs, contingencies, profit), and most importantly, scope (project size, goals, requirements). All these elements are interrelated. Each must be managed effectively. All must be managed together if the project, and the project manager, is to be a success. John Reh (2010)

Without knowing the factors influencing the movement of copper price on LME, the project manager would not know how to manage the cost effectively.
d. *Price Volatility.* 21st century, commodity prices had been in general decline for some decades. During mid-2008, commodity prices rose by about 75% in real terms on average. By historical standards, this latest commodity boom was broad-based and sustained, with the prices of most commodities rising sharply (especially energy and industrial inputs, including agricultural raw materials and metals, but also major food crops and some beverages). After the financial crisis erupted, commodity prices fell rapidly, and they have since remained very volatile. It remains to be seen to what extent strong commodity price pressures re-emerge as the global economy recovers. Spatafora & Tytell (2010)

The volatility of the Copper LME price would affect the global economics. Therefore, it is critical to understand the factors influencing the movement of copper price on LME.

1.2 *Objective of the Study*

The general objective of this study is to determine and find out the underlying factors behind the copper prices; how they formed and what determined them.

The specific objectives of the study include the following:-
a. To determine whether the copper stock level influence the copper price;

b. To find out the relationship (positive or negative) between exchange rate and copper price; and

c. To determine whether the movement of aluminium price would influence the copper price.

1.3 Scope of the Study

The scope of this study is to test how significant is the following variables; copper stock level, aluminium price and exchange rate, are in determining copper prices, using an econometric approach.

The study covers the monthly data from 2006M1 to 2009M12. For copper stock level, aluminium price and copper price, the study would use the price traded in LME. For exchange rate, the study would use the real effective exchange rate data from the International Monetary Fund.

1.4 Significance of the Study
Copper was a very common commodity used in a lot of industries, especially cable industry. To understand the factors influence the movement of the Copper LME price not only prevent them from written off their stock during Copper LME price bearish but also taking opportunity to earn more through keeping more stock during Copper LME price bullish.

1.5 Limitation of the Study

The limitation of study is that the researcher only using the data from 2006M1 to 2009M12 that were traded in LME and published in the International Monetary Fund. Besides, other factors such as the copper demand of the China (Copper largest demand country) and US Gross Domestic Products index that might influence the copper price on LME were not included in this study.
CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

This chapter will review the literature relate to the study topic. First, the existing study of
the stock level, aluminium price and exchange rate influence to copper price movement
would be presented. Thereafter, the studies related to the price formation. Finally, it wills
summaries the literature review. This chapter will be divided into these sections:

2.1 Stock Level and Price Movement

Heaney (2005) highlighted that stocks can be quite high, for example copper in 1997, and
yet a sudden drop in stock levels can lead to a shift in price distribution. Perhaps this is
expected, given the arguments of Wright and Williams (1989), because the link between
price distribution and LME stock levels should reflect the increased dispersion of LME
warehouses across the world after 1962.

Keynes (1950) provides discussions of the behavior of commodity prices and the
relationship between commodity price, production and stock levels. If we ignore hedging
costs (Telser (1958)), then Keynes’ argument is simply that when stocks are high the
difference between futures prices and the underlying asset price (spot price) reflects the cost of storing or carrying the underlying asset but when stocks are low commodity prices tend to reflect the value of immediate consumption and the link to the value in storage is broken. For example, spot price could exceed the futures price when stocks are low. (Keynes, 1950b)

Gross (2006) mentioned that in the futures market, prices are created via the balancing of supply and demand which themselves are contingent upon the information currently underlying the market process. Fama and French (1988) predict that futures prices are less variable than spot prices (the Samuelson hypothesis holds) when inventory is low. When inventory is high, however, the theory predicts that spot and futures prices have roughly the same variability. Using a simple proxy for the level of inventory, testing on the industrial metals, aluminium, copper, lead, tin and zinc, consistently support the refinement of the Samuelson proposition.

BaseMetals.com (2000b) mentioned that the wide production base means there are numerous factors (such as labour unrest, political unrest and etc) that can affect production and therefore prices.

Paul Stathis (2007) highlighted that Asia currently consumes 50% of the world's copper production, so it is a major factor, but not the only driver. It can not be viewed in isolation from the many other factors affecting the LME copper price. This was supported
by Distributor Wire and Cable Company (2008) which mentioned that the most obvious reason for the rising price for any commodity is demand. Copper is no different. A key explanation for the continuing climb in copper prices the past 5 years is the increased demand for the metal globally, specifically China.

The two separate copper markets (U. S. and non-U. S.) are converted by inputs, the generally free London Metal Exchange and scrap markets, and the price-setting behavior of U. S. producers. The copper market is found to be characterized by low short-run but very high long-run price elasticities, making for considerable sensitivity to exogenous forces. Perhaps the most interesting finding of the simulation is the prediction that Chilean output would be very sluggish even in the absence of nationalization and that Chilean revenues would be substantially increased were the Chilean government to increase domestic mine production and to allow world prices to adjust accordingly. (Fisher, Cootner and Baily, 1972)

Commodity prices are principally determined by supply and demand. Too much supply of copper brings down prices while heavy demand brings up prices. Supply comes from inventories and production from copper mines. Demand comes from users and uses. The more volume and types of use for copper, the bigger the demand. The higher the demand and the lower the supply, the higher the price. Romualdez (2010)