

Stocks vs. their underlying commodity

– a comparison analysis

Supervisor:

Susanne Arvidsson

Authors:

Daniel Varaona 860514

Jonas Åström 860609

Sammanfattning

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Författare: Daniel Varaona, Jonas Åström

Handledare: Susanne Arvidsson

Nyckelord: Råvaror, aktier, avkastning, volatilitet, korrelation, diversifiering, vertikal integration.

Syfte: Syftet är att undersöka till vilken grad diversifiering och vertikal integration påverkar avkastning, volatilitet och korrelation av företag inom råvaruindustrin. På detta sätt kan analytiker fatta mer informerade beslut när portföljer skapas.

Metod: I vår metod börjar vi med att hitta lämpliga företag för analys. För dessa företag kan historisk information hämtas från Datastream, årsrapporter, bankers och företagens hemsidor för vidare analys. De data som erhållits från Datastream bearbetas för att hitta värden för avkastning, volatilitet och korrelation. För att få en djupare förståelse av företagens egenskaper görs även intervjuer med medarbetare från företagen.

Teoretiska perspektiv: Vi använder oss av ett antal olika teorier för att kunna analysera den empiri vi tar del av. De teorier vi använder är diversifiering och vertikal integration. Tidigare forskning ingår också inom ramverket. Detta hjälper oss att dra rationella slutsatser med teoretisk grund utifrån vår insamlade data.

Empiri: I empiridelen framställs relevant fakta om de företag vi har valt att gå vidare med och analysera. Detta i form av företagsinformation, information kring certifikat, terminer och de underliggande råvarorna. Vidare följer en intervjudel där flera företag besvarar frågor angående deras struktur och risker.

Resultat: Fynden visar att aktier och råvarupriser kan korrelera på en hög nivå. De underliggande råvaror verkar ha högre avkastning än företagen inom industrin, men diversifierade företag kan ha en lägre volatilitet. En aktie är ett bra alternativ till råvaran om har en välutarbetad diversifiering, en vertikalt integrerad struktur och inte använda sig av hedging policy gentemot sin underliggande råvara.

Abstract

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Authors: Daniel Varaona, Jonas Åström

Supervisor: Susanne Arvidsson

Key words: Commodities, stocks, return, volatility, correlation, diversification, vertical integration.

Aim: Our aim is to investigate to what extent diversification and vertical integration affect return, volatility and correlation of companies in the commodity industry with its underlying commodity. In this way, analysts can make more informed decisions when creating a portfolio.

Methodology: Our method consists of finding suitable companies to analyse. For these companies, historical information from Datastream, annual reports, banks and corporate websites is retrieved for further analysis. The data obtained from Datastream is processed to find the values for return, volatility and correlation. To get a deeper understanding of the characteristics of the firms, interviews with employees are also carried out.

Theoretical framework: We use a variety of theories to help analyse the empirical data we have examined. The theories we use are diversification and vertical integration. Previous research is also presented in the framework. This helps us draw rational conclusions with the theoretical foundation based on our collected data.

Empiricism: The empirical section presents relevant facts relating to the companies we have chosen to proceed with for analysis. This comes in the form of corporate information, information surrounding certificates, futures, and the underlying commodities. It also follows with an interview section, where several companies answer question concerning their structure and risks.

Conclusion: Findings reveal that stocks and commodity prices can correlate on a high level. The underlying commodities seem to have higher returns than companies within their industry, but diversified companies can have a lower volatility. Stocks are good alternatives to the real commodity if they have moderate diversification, a vertically integrated structure and a non-hedging policy towards their underlying commodity.

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1. Introduction

1.1 Background

The Stockholm stock exchange presented a list of traded commodities, including gold, oil, and several others, in the spring of 2008, and already in September the same year it had a turnover of about 500 million SEK.¹ According to Göran Titze, private banker at Danske Bank in Malmö, the interest for alternative investments is growing and investors contacting Mr. Titze often want a part of their portfolio to consist of something else than ordinary stocks. They seek alternative investments such as forest or commodities.

But what is it about these alternative investments that is so attracting, and why has the interest for commodities been growing in the recent years? At least some reasons are quite obvious. Firstly, it is well known that diversification is good for a portfolio. A higher degree of diversification reduces risk in the portfolio due to different correlations with the market. A portfolio including commodities diversify the total holding and reduce risk.² Secondly, commodities can gain value by rising inflation and are thereby a good investment alternative, or even a safe haven, during an unstable economic market when other assets tend to lose value.³ A commodity can never be worthless. Thirdly, the world economy is under constant development where new economies are born on daily basis and demand is rising on commodities such as steel, energy and grain providing building material, light, food etcetera.⁴

A further reason, not as obvious as the reasons above, is the lack of interest in the more classic investment alternatives such as regular industrial stocks due to both risk and eagerness for something new.⁵

All these reasons has created a demand and pushed the financial markets to come up with investment alternatives that are easier to purchase, such as commodity certificates and online

¹ <http://www.dn.se/ekonomi/din-ekonomi/ravaror-jordnara-i-portfoljen-1.976127>, 2010-12-05

² <http://hcm.handelsbanken.se/struktureradeprodukter/Start/Andravanstermenyn/Ravaror-och-ravaruplaceringar/>, 2011-01-02

³ Ibid

⁴ <http://hcm.handelsbanken.se/struktureradeprodukter/Start/Andravanstermenyn/Ravaror-och-ravaruplaceringar/Ravaror/>, 2010-12-05

⁵ <http://www.privataaffarer.se/aktier/200904/stort-intresse-for-alterna/>, 2010-12-05

gold stores. The demand for commodities has created trading platforms, websites and dedicated magazines solely reporting about commodities and how to buy these. The investors coming to Göran Titze at Danske Bank often do not know very much about alternative investments in general, and commodities in particular. The risk aversion and the unknown characteristics of specific commodities make some investors avoid the whole idea of alternative investments. However, there is a plethora of companies having several or specific commodities in the supply chain as a core business. Maybe a regular stock gives a more confident feeling and holds the same characteristics but is likely to, in the end, yield the same return.

1.2 Problem discussion

Since, according to Göran Titze, the alternative investment market now aims to a broader mass of investors it is interesting to investigate if the shares belonging to a company in close relation with a specific commodity correlate well with the actual commodity. If so, is it safer to buy the stock rather than the commodity? Is it possible to invest in a stock instead of the underlying commodity and still achieve a growth in close contact with the commodity price? Which alternative gives a higher return? These are questions most investors do not know the answer to, which makes our thesis important to understand the possibilities of alternative investments within the commodity market. Since the economy still is a bit unstable, the future is uncertain and there is a high demand of this kind of investment, and therefore a thesis covering this area is of great importance. There has not been a thorough study comparing a company's share price to that of its underlying commodity, and hopefully the results of this thesis can help investors to make better and safer investments in alternative investment objects. There has been research surrounding the relationship between commodities and the market during different economic environments, but none have analysed and compared companies to their underlying commodity. Furthermore, if there is a connection between the two, what characteristics do the companies have that make them correlate with their underlying commodity? Can vertical integration and diversification play a role in this? How do these characteristics affect the companies' volatility and return when compared to their underlying commodity? These are important factors to take in consideration for investors and analysts when creating their own portfolio.

1.3 Problem formulation

When comparing the share price of a company in the commodity industry with its underlying commodity price, to what extent does diversification and vertical integration affect the share price return, volatility and the correlation between the two?

1.4 Delimitations

We have chosen to investigate four companies in different commodity industries. The four companies are British Petroleum (oil industry), Corn Products International (corn industry), ArcelorMittal (steel industry), and Barrick Gold (gold industry). This limitation makes the investigation more thorough since more time is spent examining the companies different characteristics. In this manner, the effects of diversification and vertical integration may be more apparent. These companies are also public companies which facilitates the gathering of historical information. The companies are also in different markets, which increase the variety of the investigation.

Further, we have included descriptions of three different ways to directly invest in commodities, the physical commodity, futures and certificates, but these will not be analysed. This is because both futures and certificates should be as close to buying the actual physical commodity, and therefore no further attention to this matter should be included in this thesis. We also exclude all other forms of investing in commodities, such as funds and other.

1.5 Aim

Our aim is to investigate to what extent diversification and vertical integration affect return, volatility and correlation of companies in the commodity industry with its underlying commodity. In this way, analysts can make more informed decisions when creating a portfolio.

2. Method

To be able to analyse the extents of affects of diversification and vertical integration on return, volatility and correlation in companies operating with a certain commodity, we looked for companies whose main business is a specific commodity with the specific trait of being a public company. This would allow us to gain data for the past ten years, which can then be compared to the data obtained from their underlying commodity during the same time period to acquire results for their return, volatility and correlation. Another explicit quality is the availability of information of company diversification, structure and the possibility to interview. This would provide us with the information needed for further analysis. From these criteria, four candidates were found; British Petroleum, Corn Products International, the steel company ArcelorMittal and Barrick Gold Corporation.

Our sources for this thesis are in the form of Datastream (Information database), websites, annual reports and different types of interviews. This provides a broad range of information access. The companies we are in contact with are ArcelorMittal, Barrick Gold Corporation and British Petroleum. We have interviewed employees in the Investor Relations division to obtain specialised answers surrounding the subject of diversification and other effects on company return and volatility. This may be what resolves our final analysis.

Concerning our way of reasoning, this may be classified as deductive, since we base our thesis on previous research and theory to be able to test our five hypotheses. The thesis is considered to be quantitative where findings are weighted with qualitative information through interviews.

In the method section of this thesis, we present our form of interview and reasoning surrounding the quality of data. Furthermore, the method of data management with return, volatility, correlation and regression analysis is presented to explain how the results are obtained.

2.1 Form of interview

The form of interview chosen is modified to the general criteria that define the semi-structured interviews. An interview guide with the general topics has been developed, but the respondents have been given a broad amount of space and freedom to formulate their answer.⁶ The general form of the interviews has been open discussions in which the interviewee has been met with additional questions if relevant. The aim of the interviews is to complement the information from the written materials we studied. Since there is not much research on alternative investments, the information obtained from these interviews is therefore a great source of information apart from the literary material. All interviews are done over the phone or written over e-mail due to the fact that the distance between the interviewer and respondent was of great significance, and for personal economic reasons. On the other hand, there is no indication that this will have any effect on the interview interpretation. The interviews have been recorded in order to avoid errors in information processing. Both authors have participated in the interviews to the fullest in order to avoid problems with response interpretation. The form of interviews done and the amount of numerical research give the investigation a quantitative approach.

2.2 Choice of material

The information surrounding the chosen companies is directly acquired on their websites and annual reports. The data concerning the certificate prices of commodities and company stocks are extracted from the program Datastream.

2.3 Reliability

The data acquired is from the program Datastream, the largest program for financial data on a global scale.⁷ For this reason the stock and commodity prices obtained from this source are consistent with the actual prices on the market, a historic consistency. Datastream is therefore a very reliable source of data in this analysis.

⁶ Bryman, Alan & Bell, Emma, *Företagsekonomiska forskningsmetoder*, 2005, sid 263

⁷ <http://online.thomsonreuters.com/datastream/>, 2010-11-22

Concerning our other sources, such as interviews, websites and annual reports, they are reliable in the sense that some information from one source is confirmed by another. The information from interviews concurs with the websites and annual reports. The interviews are with professional employees who are well established in their field, which adds significance to the sources reliability.

2.4 Validity

As aforementioned, Datastream is a very reliable source. This does not evidently mean that the data has a high level of validity, although in this case the stock and commodity prices are not only consistent, but are also equal to the real prices of these items, both past and present. Therefore, the validity of the data collected from Datastream is also at a high level.

Further collected information from websites, annual reports, telephone interviews and e-mail interviews are all biased for they may be subjective towards the information receiver. This is therefore not a valid source of information, but adds significant value to the thesis.

2.5 Source criticism

Our main source of information surrounding the companies in question comes from their annual reports and their webpage. However, it is important to remember that this information from the different companies is only a picture of their own perspective, but cannot be used as an accurate source. The webpage and annual reports are biased due to the fact that the main focus of the reports is to provide the stakeholders with positive information to stimulate the feeling of security. These viewpoints must be continually analysed and further put into a larger perspective.

The same argument can be used to criticise the source for commodity information. This information can be distorted due to the fact that this information's purpose is to sell to potential investors. The same applies for the interviews as the collection of materials from the different annual reports. In the interview analysis, it is important to remember that the information obtained is a reflection of an individual's point of view on the subject and it is up to the authors to put these results into a larger perspective.

2.6 Volatility

The volatility of a stock is estimated through its standard deviation. To calculate the volatility, the first step in the process is calculating the variance of the company's returns. This is done through the following formula:

Equation 1

$$Var(R) = \frac{1}{T-1} \sum_{t=1}^T (R_t - \bar{R})^2$$

The square root of the variance is equal to the standard deviation, volatility.⁸

To handle our data acquired for the commodity certificates and the company stocks to calculate their annual volatility, we must first calculate the daily return for each of these. An average is calculated by summing up the daily return from the past ten years and then dividing the result by the number of samples. We then use the variance formula to subtract the average daily return from each daily return, and square this result to obtain the daily variance. The daily volatility is the square root of the daily variance. To calculate the annual volatility, this result must be multiplied by the square root of 250, the number of days the certificates and stocks are traded per year.

2.7 Correlation

Correlation is a term standing for statistical dependency between two quantities of data. The statistical term is often used when presenting the correlation coefficient, which is a measure of the degree of linear relationship. This degree can be both positive and negative, depending on the relationship.⁹ A correlation coefficient of “1” means that a change in one of the two quantities affects the other quantity in the exact same way. Similarly, a correlation coefficient of “-1” means that a change in one of the two quantities affects the other quantity in the exact opposite way, that is, a perfect negative correlation.

⁸ Berk, J., DeMarzo, P., *Corporate Finance*, Pearson Education, Inc., 2007, pg 293

⁹ <http://www.ne.se/korrelation>, 2010-12-12

By dividing the covariance of two variables, in our case a company stock and its underlying commodity certificate, with the standard deviation of each variable multiplied with one another, we obtain the correlation.

2.8 Regression and regression analysis

Regression is a term in statistics explaining the relationship between a dependent or response variable and one or more explanatory variables.¹⁰ Through the observed data, a line can be calculated and drawn which explains the overall trend between the variables. The data and the relationship can be analysed by creating a function mathematically explaining the relationship between the variables. This function explains the outcome of the response variable when the explanatory variable changes with one unit. A determination coefficient is also provided through the regression analysis. This coefficient helps us to determine how reliable the correlation coefficient is, which gives further certainty for our arguments.

In our four regressions, we determine the relationship between each company stock price and the price of its underlying commodity certificate. This can be done by creating a regression graph where the determination coefficient is given.

¹⁰ <http://www.ne.se/regression/1097637>, 2010-12-12

3. Theoretical framework

This chapter presents the different theories used when analysing the empirical information. These theories will help by giving a clearer picture to reach a relevant result. It also presents previous research and an idea of where the research stands today. The previous research and presented theories help us to answer the problem formulation. The chapter will also give the reader an understanding of the subject as well as the reasoning presented in the analysis. The focus is laid on theories of diversification and vertical integration, in comparison to earlier similar studies analysed with theories such as investor's utility¹¹ and efficient-market hypothesis¹². These theories of diversification and vertical integration state that costs can be cut and risks may be lowered and may therefore have an affect on return and volatility. The theoretical framework is built on literary sources from articles and course literature.

3.1 Diversification

3.1.1 Diversification and risk

The portfolio diversification is usually applied to funds, portfolios and different set-ups within investments, but this theory can also explain the effect of diversification within a firm. In the same way this theory explains the reduction of risks in a portfolio containing financial tools, such as stocks and derivatives, it can also explain the reduction of risks within a company through a broadened product range to fulfil diverse customer needs.

For every firm, there is both systematic (common) risk and unsystematic (independent) risk. Systematic risk is the correlated risk existing between firms. In other words all companies have the same risk and all firms are affected by it. On the other hand, unsystematic risk is the individual risk carried by each different firm. When one company is affected it does not necessarily mean that the others (in the same market, geographical location, etc.) are affected by it as well. To protect the firm and the stockholder's interests from unsystematic risk, the risk can be averaged out through portfolio diversification.¹³

¹¹ Ericsson, E. et al., *Råvarumarknaden vs aktiemarknaden*, Södertörns högskola, 2010

¹² Baur, D. et al., *Is gold a hedge or a safe haven?*, Dublin City University, 2009.

¹³ Brentani, C., *Portfolio Management in Practice*, Elsevier Butterworth-Heinemann, 2004, pg 22-23

How diversification can reduce the unsystematic risk can be shown through the following example. When betting on horses, there are 12 horses on the track each with the odds 10:1. When betting \$1 the expected return for the bookie is:

Equation 2

$$E(R) = \Sigma(\textit{Probability} \times \textit{Return}) = \left(\frac{1}{12} \times -\$10\right) + \left(\frac{11}{12} \times \$1\right)$$

Through equation 2 we obtain that for each bet, the bookie earns an average of \$0.08333 which equals 8.333%. The following step is to calculate the variance of the bet through:

Equation 3

$$\textit{Var}(R) = E[(R - E[R])^2] = \frac{1}{12} (-\$10 - 0.08333)^2 + \frac{11}{12} (\$1 - 0.08333)^2$$

This gives us a variance of \$9.243 which helps us calculate the standard deviation with the formula:

Equation 4

$$SD(R) = \sqrt{\textit{Var}(R)} = \sqrt{9.243}$$

The standard deviation received is \$3.04 which is very high and means that the returns for the bookie can be negative. The standard deviation value can be diversified through a betting on a larger amount of races. Let's say, hypothetically, that the bookie took bets for 10 000 different races instead of one. In this scenario the standard deviation would be:

Equation 5

$$SD(\textit{Average of independent risk}) = \frac{SD(\textit{Individual risk})}{\sqrt{\textit{Number of observations}}} = \frac{3.04}{\sqrt{10\ 000}}$$

In this way the standard deviation diminishes to \$0.0304 which means that with a 95% confidence interval the result of each one dollar bet will lie $\$0.08333 \pm 2 \times \0.0304 , in

other words between \$0.02253 and \$0.14413 for each dollar. With one dollar bets on 10 000 different races the expected returns would be between \$225.3 and \$1441.3 at the end.¹⁴

This same principle can be used within a firm. Through diversification of one's product range, the unsystematic risk, standard deviation, can be minimized. The greater amount of products in a company, the lower the unsystematic risk will be. The problem is that companies carry both common and unsystematic risk. For this reason, by diversifying the unsystematic risk through a greater number of products in the firm, the systematic risk will still remain.¹⁵

3.1.2 Resource diversification

Companies chose to diversify due to several different situations. One of these reasons is to average out risks as shown in the portfolio diversification, explained above. This is done within a company by not putting all eggs in one basket and in so doing averaging out risks throughout their product lines. The risk factor is of great importance but diversification may also be used for expansion, growth and economies of scope.¹⁶ This means that apart from risks, an optimisation of revenue and return is also in focus concerning diversification and is therefore highly applicable in our study.

Diversification can be useful for any company but must be used carefully. The Ansoff matrix (Table 1) describes in which situations diversification can be used for expansion and growth.

Table 1

Market \ Product	Present	New
Present	Market penetration	Product development
New	Market development	Diversification

¹⁴ Berk, J., DeMarzo, P., *Corporate Finance*, Pearson Education, Inc., 2007, pg 301-302

¹⁵ Brentani, C., *Portfolio Management in Practice*, Elsevier Butterworth-Heinemann, 2004, pg 23

¹⁶ Ansoff, I., *Strategies for Diversification*, Vol. 35 Issue 5, Harvard Business Review, 1957, pg 114

Through *market penetration*, the company tries to increase revenues, and thereby returns, with their present products. This can be done by acquiring new consumers in other markets or increasing the sale of product to existing customers. By enforcing the alternative *market development* the company does not develop new products, but instead uses and adapts their existing product and enter new markets. *Product development* is the opposite; here new products are developed for the customers in the present market. *Diversification* in the Ansoff matrix is the expansion into new markets with new product lines. This will require new knowledge and skills in comparison to the other three alternatives, which normally changes the firm's business structure.¹⁷

A firm can stimulate growth through a variety of ways. A company can stimulate by gaining power over foreign sources of goods along with finding new markets, the development of their present product lines, and the creation of different products for a new set of customers in new markets.¹⁸ Growth was the main influence for companies starting to diversify. Highly technological firms noticed that their knowledge could be used to create new products for new markets and in so doing stimulating company growth.¹⁹ As well as using diversification for growth, it can also be used to lower average unit-costs through scope advantages. The ability to take scope advantages through diversification is determined by the company's capabilities to manage different product lines efficiently through systems for logistics and distribution, as well as the management of facility investments. The development of economies of scope through diversification is one of the deciding factors to a company's size.²⁰

Diversification opportunities may be found in three different ways. The most distinct kind of diversification is *lateral diversification*, which is expanding into unknown markets outside of its own. This wide perspective gives companies a number of possibilities into uncharted industries. There is also *horizontal diversification* which can be defined as the expansion of different product lines from the present but still under the company's know-how capabilities as well as the experience. The last way to diversify is through *vertical diversification* and can

¹⁷ Ansoff, I., *Strategies for Diversification*, Vol. 35 Issue 5, Harvard Business Review, 1957, pg 114

¹⁸ Chandler, A., *Strategy and Structure*, The MIT Press, 1974, pg 42

¹⁹ Ibid, pg 42-43

²⁰ Teece, D., *The Dynamics of Industrial Capitalism*, Journal of Economic Literature, 1993, pg 212

be achieved through acquisitions or expansion up or down the supply chain. This may not seem as diversification, since it is still in the same field of the core business, but it is still distinct regarding processes, technology and purpose.²¹

3.2 Vertical integration

This theory is basically vertical diversification, as mentioned above, due to the fact that the expansion occurs within the firms own supply chain. The theory of vertical integration is an important factor for today's companies, since it is a debated subject whether it has any effect on costs and risks over time or not. In our case, the commodity based companies chosen may not be vertically integrated to the extent that they have total cost control through the supply chain. Therefore, we want to investigate if the companies choose this strategy and to what extent it affects return, volatility and correlation.

This is a theory of efficiency of the interaction between the firm, contracts and markets. The control that a company has over its inputs and outputs including distribution is called vertical integration. The firm becomes a vertically integrated organisation if an upstream firm expands into the downstream process, or a downstream firm expands into the upstream process.²² The expansion of the firm has the effect of extending the value chain, meaning that it absorbs the value chain of a supplier or distributor. When a company controls the supply or input it is called upstream integration, and when it has the control over the distribution channel of outputs it is called downstream integration. The operations expansion gives the company full ownership and control over its up- or downstream operations in the supply chain.²³

There are both pros and cons connected to vertical integration. The integration lowers the transaction costs due to closer information and in-house operations and synchronises the supply chain, giving control over economies of scope.²⁴ The internal losses that can occur are monetary losses due to a large amount of capital invested into new operations.²⁵

²¹ Ansoff, I., *Strategies for Diversification*, Vol. 35 Issue 5, Harvard Business Review, 1957, pg 118

²² Perry, M., *Vertical integration: Determinants and effects*, Elsevier Science Publishers B.V., 1989, pg 185

²³ Ibid pg 185-187

²⁴ D'Aveni, R., Ravenscraft, D., *Economies of integration versus bureaucracy costs: Does vertical integration improve performance?*, Academy of Management Journal, 1994, pg 1167

²⁵ Buzzel, R. D., *Is vertical integration profitable?*, Harvard Business Review, 2009, pg 92-102

3.3 Previous research

Further, we present previous research to explain what has been done within this subject and where we are today.

3.3.1 Vertical integration

The subject vertical integration and the benefits in form of greater profits to the company has been widely discussed. In the article "*Economies of integration versus bureaucracy costs: Does vertical integration improve performance?*" written by D'Aveni, R. and Ravenscraft, D in 1994, the authors state that the benefits of vertical integration seems to be marginal, since the costs it is supposed to reduce by diminishing costs of R&D, administration and advertising are put against the higher expenditure of production of backward vertical integration (upstream). Forward integration diminishes administrative costs, but in the end this is all averaged out and has a marginal impact on profits.

The author Buzzell, R. D states in his article "*Is vertical integration profitable?*" from 1983 similar arguments, but concentrates on the costs of acquisitions of the in-house supply chain. However, most of the research done within the subject vertical integration is a bit aged and therefore maybe not wholly applicable to the businesses of today, and can therefore be an interesting aspect to take into consideration.

3.3.2 Diversification

Ansoff I. wrote in 1957 the article "*Strategies for Diversification*" about diversification that still today is very sane and used in general diversification strategy management. Ansoff. I there conclude that a company can chose between market penetration, market development, product development and diversification when choosing a product-market strategy, that is, a product line and the missions they are set to fulfil. When studying diversification today, the models and arguments presented in this article are still used.

3.3.3 Commodities

In the master thesis "*Commodity market vs. stock market*" written by Ericsson E. and Henriksson J. in 2010 the authors examine the commodity price and stock market performance during different business cycles between the years 1969-2009. They discuss the option of investing in commodities as an alternative to stocks and conclude that gold as a commodity has a different way of reacting to economic scenarios than the stock market, where negative correlation is a fact. Beside from this, they see tendencies where commodities react marginally positive to negative trends on the stock market.

Duggal R. and Shams T. mention the great interest in commodity investment as one of the main reason for their bachelor thesis "*Modern trading portfolio with commodities*" written in 2010 about optimal commodity portfolios for investors with known and unknown risk preferences. In their study, none of the two created portfolios had higher returns than the market during the observation period 2000-2010.

3.3.4 Gold

The authors Baur D. and Lucey B. investigates the hypothesizes gold as safe haven or gold as hedge in their article "*Is Gold a Hedge or a Safe Haven? An Analysis of Stocks, Bonds and Gold*" written in 2010. These two differ in the time and situation perspective where the first one state that gold is as a safe investment that is uncorrelated with the financial market during a financial crash, and the latter hypothesis where gold is uncorrelated with stocks and bonds on average. Baur and Lucey conclude that gold is a safe haven in extreme stock market conditions and a hedge on average.

Further, in the thesis "*Guld, ett gyllene inslag i portföljen? : En studie om guldets diversifieringsegenskaper för svenska småsparare*" the authors Hilling P. and Sjöqvist E. investigates the properties of gold and the benefits of investing in gold as a diversification to risk. What they see is that there are good reasons to include gold in a portfolio due to its diversifying properties, meaning that the commodity does not follow the same pattern as stocks and bonds.

3.3.5 Corn

In the thesis *"Maize and sugar prices: the effects on ethanol production"* written by Porrez F in 2009, the author discuss and test the effects of maize (corn) and sugar on ethanol production and concludes that the corn production has a impact on the level of ethanol output. Porrez sees a rapid growth in the maize production during the last years, which has given the commodity a greater role and impact on the economy.

3.3.6 Steel

Even though steel is a widely traded commodity and large corporations have steel as a core business, there has not been much published research covering only the properties of steel as an investment. However, since steel is a generally accepted commodity, steel is often included in the general development of commodity prices and thereby indirectly investigated in published articles and essays. However, the authors Hall G. and Rust J. study the steel market and speculation of commodity price in their article *"Econometric Methods for Endogenously Sampled Time Series: The Case of Commodity Price Speculation in the Steel Market"* written in 2002. They present a model that can be used for steel commodity investments. This model can be modified to be used for different commodity types.

3.3.7 Oil

As with steel, there has not been much research covering the characteristics of oil commodity only. Oil is also a generally accepted commodity, and is used in many articles investigating a commodity average. The authors Ericsson E. and Henriksson J. wrote in their thesis *"Commodity market vs. stock market"* from 2010 (described above under the header "Commodities") about the commodity market performance, where oil was one of the five commodities included.

4. Empiricism

The empirical chapter provides gathered facts surrounding the different kinds of alternative commodity investments such as future contracts and commodity certificates, which are common forms of directly investing in commodities. Further empirical facts regarding the chosen commodities and companies are also included. This empirical information will be a stepping stone towards obtaining valid results and provide a greater understanding for further analysis.

4.1 Commodities

4.1.1 Oil

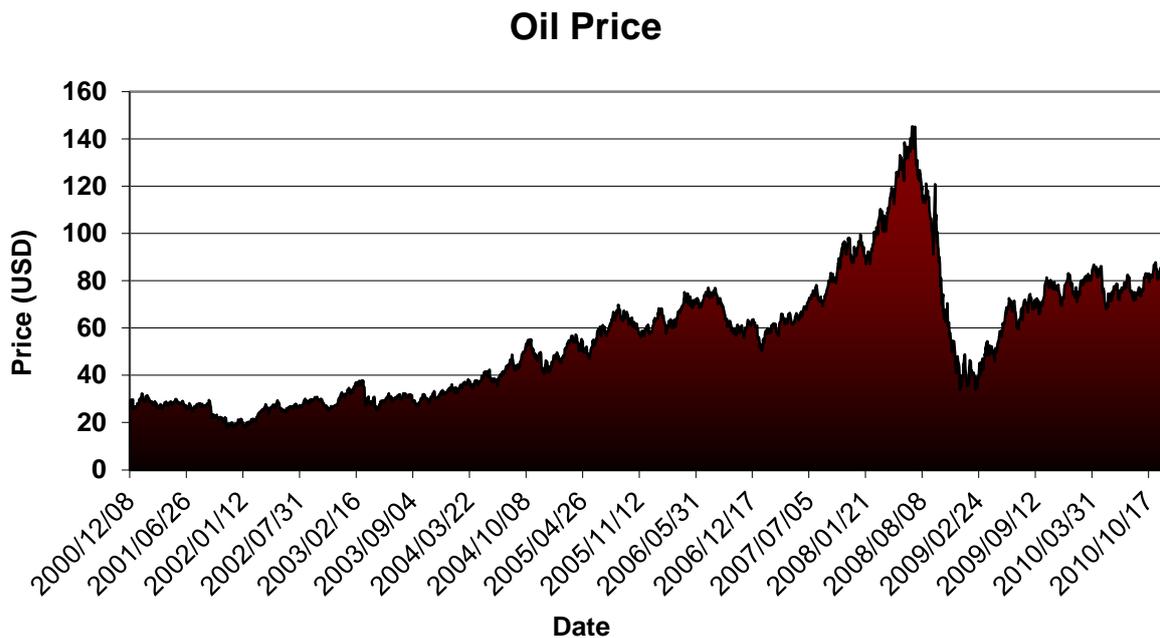
Crude oil is today the most traded commodity and is traded and bought in barrels.²⁶ There is a plethora of different oil qualities traded, but crude oil is the most popular among them. Within the crude oil quality there is “Brent” from the North Sea and “West Texas Intermediate”, (WTI), from the USA. This crude oil quality is the most common fuel used on the planet and is also used in plastics production and other synthetic materials. The oil is very sensitive to production irruptions due to the limited amount of it, covering only about 60 days of normal oil consumption days ahead.²⁷ Oil futures can be bought on The New York Mercantile Exchange, NYMEX. Crude oil futures are bought in 1000’s of barrels. Oil is a good investment if one believes in the rapid rise of new economies with a higher demand in energy.²⁸

²⁶ http://www.cmegroup.com/trading/energy/crude-oil/light-sweet-crude_contract_specifications.html, 2010-12-28

²⁷ <http://hcm.handelsbanken.se/struktureradeprodukter/Start/Andravanstermenyn/Ravaror-och-ravaruplaceringar/Ravaror/Olja/>, 2010-12-28

²⁸ Ibid

Figure 1



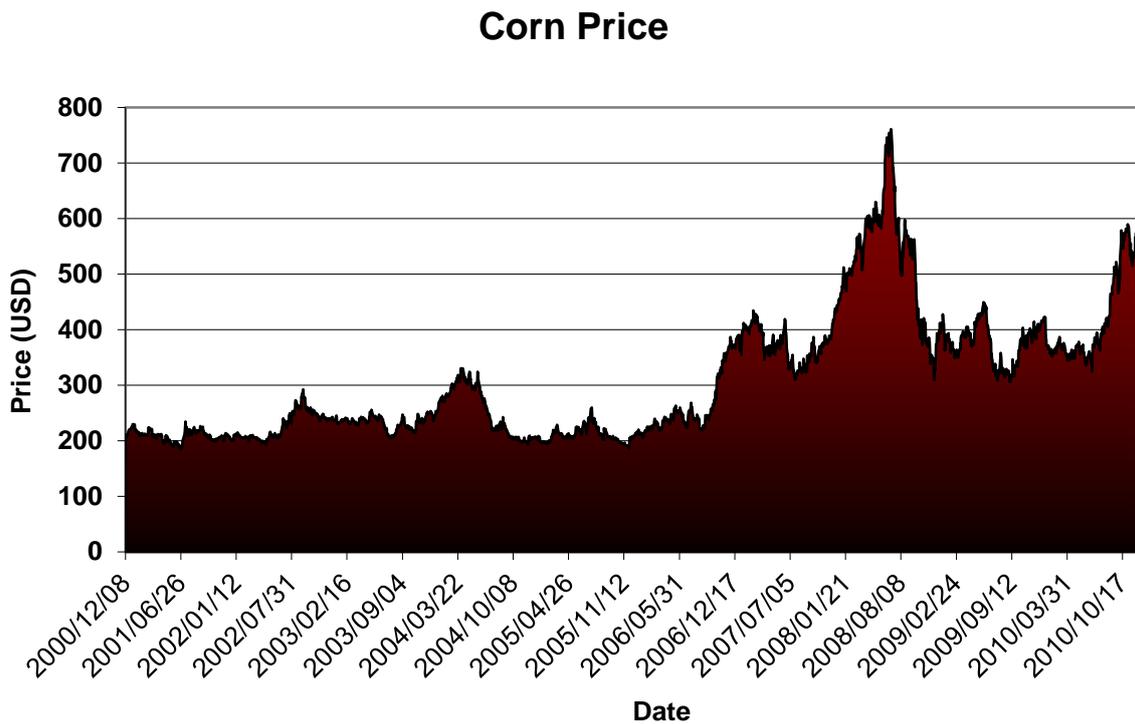
As we can see in Figure 1, the oil price has experienced great changes the last ten years. The price of oil has more than doubled and gone through a major decrease under the financial crisis. Its current price lies around 88 USD per barrel.

4.1.2 Corn

Corn is the third most common seed used around the world after wheat and rice. The increased use of corn has contributed to its greater importance. Its popularity is due to its capacity to grow in many different climates and temperatures. There are many different kinds of corn and they are used for different things. Today corn is not only consumed as its raw material, but can also be used for pop corn, oil, starch, animal feed and other. This increase use of corn has resulted in an increase of demand for the resource on a global scale. The top producing countries are consist of US, China, Brazil, EU-25, Indonesia, South Africa, Mexico and Argentina, and its main consumers are the US and China.²⁹

²⁹ <http://www.commodityonline.com/commodities/cereal/maize.php>, 2010-12-05

Figure 2



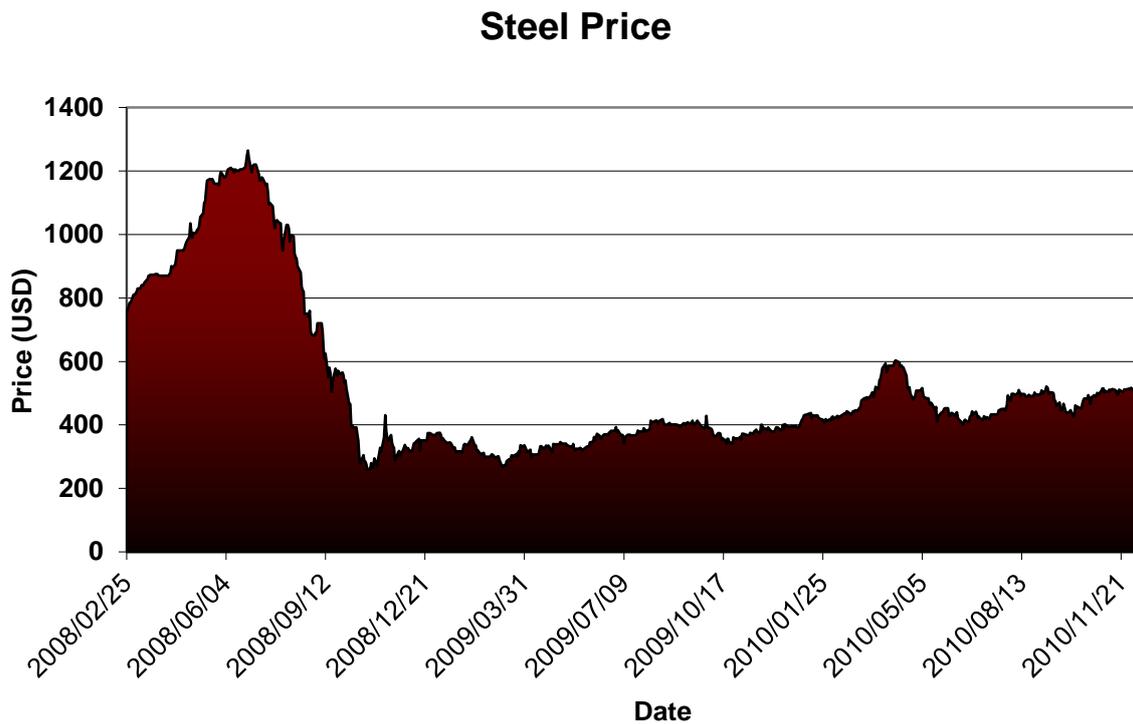
The price of corn has undergone great fluctuations during the past ten years. The largest decrease under this period was under the financial crisis. At the moment the price is around 574 USD per 5000 bushels, more than twice as much than it was at the end of year 2000.

4.1.3 Steel

Steel has become the most produced metal of modern time where the global production is 20 times higher than the other metals put together. The main reason for that is that steel is considered the most important raw material for engineering and construction industry.

When it comes to financial investments in steel, it is traded in what is called "hot-rolled coil steel" (HRC) and bought per tonne. Much of the investment made in steel is due to the hedging possibilities that steel offers. When prices fluctuate, one can always speculate and hedge against a possible dip or increase in steel with futures in the raw material. Steel futures can be bought on the London Metal Exchange, LME.

Figure 3



Steel has not been sold as a commodity future till February 2008. During its first half year on the market, steel price experienced a great rise and then a massive drop. From the end of 2008 to present day, the price of steel has had a more steady growth and is now valued about 522 USD per tonne.

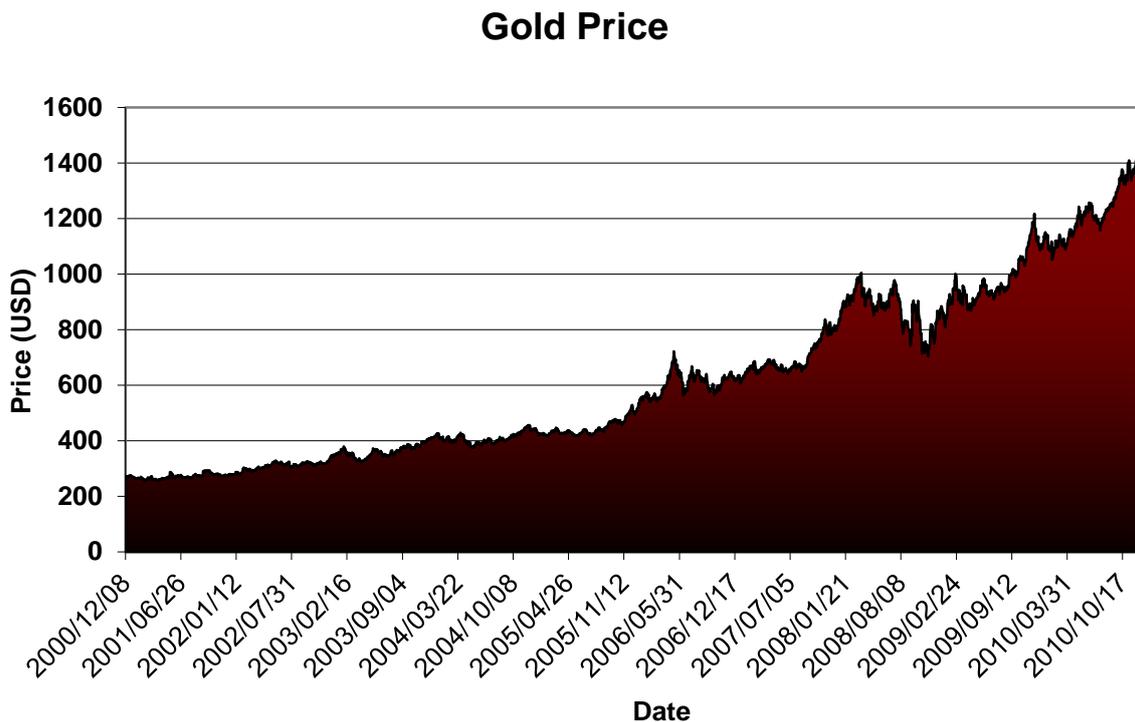
4.1.4 Gold

Of the traded metals, gold is the most popular. With a history where a high value has been connected to the metal for a long time, it is a popular investment to have as a part of a portfolio. Historically, gold has been a safe investment in turbulent times such as financial crisis where it increases in value instead of losing value as the majority of traded stocks on the stock market. Since gold has a very high value relative its weight, gold is often bought in the real raw material, which means a financial transaction with actual delivery.

Gold is good to buy if one believes that the low interest rates and the big budget deficits of the countries in the West sooner or later will lead to inflation and cause financial or political distress.³⁰

³⁰ <http://hcm.handelsbanken.se/struktureradeprodukter/Start/Andra-vanstermenyn/Ravaror-och-ravaruplaceringar/Ravaror/Guld/>, 2010-12-06

Figure 4



As we can notice in Figure 4, gold has had a quite steady growth and has not been affected by the financial crisis as much as the other commodities. It suffered a minor decrease in 2008 but recuperated in a short period of time. The price of gold currently lays around 1400 USD per 100 oz, which is more than four times as much as at the end of year 2000.

4.2 Futures Contract

A futures contract is a contract where the buyer agrees to trade an asset in the future at a fixed price that is locked in today. The buyer of a futures contract can sell the contract to a third party at any time to the market price, and therefore the holder of the contract at the expiration date is the one that face the fixed contract price.³¹ The price one can charge for a futures contract to a third party depends on the time to maturity, the actual price of the underlying asset at the time of sale and the market expectations³². It is the event at the expiration date that differs a futures contract from an option, where the buyer in the option case can chose whether she should use the option or not – the future contract will with no exception be redeemed at the expiration date. This is of course a great risk, since the underlying asset must

³¹ Berk, J., DeMarzo, P., Corporate Finance, Pearson Education, Inc., 2007, pg 935

³² Berk, J., DeMarzo, P., Corporate Finance, Pearson Education, Inc., 2007, pg 936

be bought a fixed price maybe much higher than the market price, and possibly sold to market price. Futures contracts are bought with an underlying asset in a specific quantity, for example one stock, one barrel of crude oil or 5000 bushels of corn. Sometimes futures contracts have physical delivery at the time of expiration, and this is stated in the contract specification if that is the case.³³

4.3 Commodity Certificates

In 1999 the American congress decided the Farm Bill, an agricultural and food policy tool, to contain a new kind of payment and investment opportunity. Commodity certificates were issued to replace cash payments to individuals in agricultural export programs and farm subsidies or as a security when issuing so called marketing assistance loans.³⁴ These certificates are issued, can be exchanged, by the Commodity Credit Corporation (CCC) to real commodities at any time, which differs from commodity futures, where the contract is exchange at a fixed expiration date. The certificates are direct linked with the real commodity but are not fixed to an expiration date, which makes an investment in a commodity certificate less risky and more accessible for investors, where the certificate owner can sell the certificate back to the issuer at any time and does not have to find a buyer.³⁵

Private persons can access and buy commodity certificates through banks offering this kind of investment alternative, where the bank chose the level of administrative costs, fees and price of the certificate, and can thereby compete with other banks offering the same certificates. The banks buy the certificates through the CCC and the transaction is therefore always in dollar, regardless of the currency the bank sell the certificates in.³⁶ Unlike futures contracts, the transaction of a certificate is not in the future since it is not a future opportunity but a present ongoing investment, which differs from futures where the payment of the underlying asset is tied to the date of expiration. The owner of a certificate also cannot lose more than invested, that is, one can never be bound to buying the underlying asset at a price below

³³ http://www.futurestradingpedia.com/physical_delivery.htm, 2010-12-17

³⁴ http://www.fsa.usda.gov/Internet/FSA_File/commodity_certificate.pdf, 2010-12-17

³⁵ <http://hcm.handelsbanken.se/struktureradeprodukter/Start/Certifikat/Ravarucertifikat>, 2010-12-17

³⁶ Ibid

market price, and certificates are very much like stocks in that case.³⁷ Neither is there any physical delivery at the expiration date.³⁸

4.4 British petroleum – BP

4.4.1 Organisation

Operating in over 80 countries, BP is classified as one of the largest oil and gas companies on an international scale. BP operates through international subsidiaries which deal with two business segments, Exploration/Production and Refining/Marketing. These segments consist of strategic performance units that develop relationships with external stakeholders and build up local capabilities. The strategic performance units are organised according to geographical region or the activity performed to easier to observe the performance of each unit.³⁹

4.4.2 Products

The business segment Exploration/Production covers upstream activities, relating to the exploration of both gas and oil, production and field development, and downstream activities, consisting of activities related to the ones upstream such as transportation, pipeline and processing. In this segment, marketing and trading activities of natural gas are also included.⁴⁰

The business segment Refining/Marketing includes activities related to petroleum, crude oil and petrochemical products. These activities can bear the form of manufacturing, refining, marketing, transportation, supply and trading. The third business segment is Alternative Energy that manages all low-carbon activities.⁴¹

³⁷ <http://www.alliantcreditunion.org/depositsinvestments/certificates/>, 2010-12-11

³⁸ <http://www.privataaffarer.se/ravaror/201002/ingen-handel-med-den-fysiska-ravaran/>, 2010-12-11

³⁹ BP – Annual Report, 2009, pg 10

⁴⁰ *Ibid*, pg 10

⁴¹ *Ibid*, pg 10

4.4.3 Market

The energy market is a volatile one. This may be observed through the experiences in the market during 2009. Here the market experienced a drastic drop in demand during the first half and then recuperating indications during the second half. The drastic drop lowered crude oil prices which, combined with a decent of natural gas prices, also lowered BP's margins.⁴² In the beginning of 2009 the price of crude oil had dropped by 37% and natural gas prices by 54% from the prior year.⁴³

The market demand is growing in the long-term, especially in the Asian market where urban population and income are increasing, and the demand on lower-carbon energy increases costs for R&D.⁴⁴

Table 2

Global indicator refining margins (GIM)			
	2007	2008	2009
Average GIM per barrel	\$9.94	\$6.50	\$4.00

As we can see in Table 2, the average global indicator refining margins have decreased during the past two years. From year 2007 to 2008 the GIM decreased with \$3.44 and from year 2008 to 2009 the GIM decreased with \$2.50. With an increasing capacity which is already above demand, BP believes that the GIM will continue to experience pressure for year 2010.⁴⁵

BP has situated there headquarters in the centre for finance and trading, London. At this location, BP has also established their three research and technology divisions.⁴⁶ BP's operations are taking place in over 80 different countries.⁴⁷ The areas where BP's operations can be classified as established are Europe, US, Asia, South America, Canada, Russia, Oceania, and some areas of Africa. About 20 percent of BP's fixed assets are situated in

⁴² BP – Annual Report, 2009, pg 11

⁴³ Ibid, pg 12

⁴⁴ Ibid, pg 11

⁴⁵ Ibid, pg 12

⁴⁶ Ibid, pg 10

⁴⁷ Ibid, pg 10

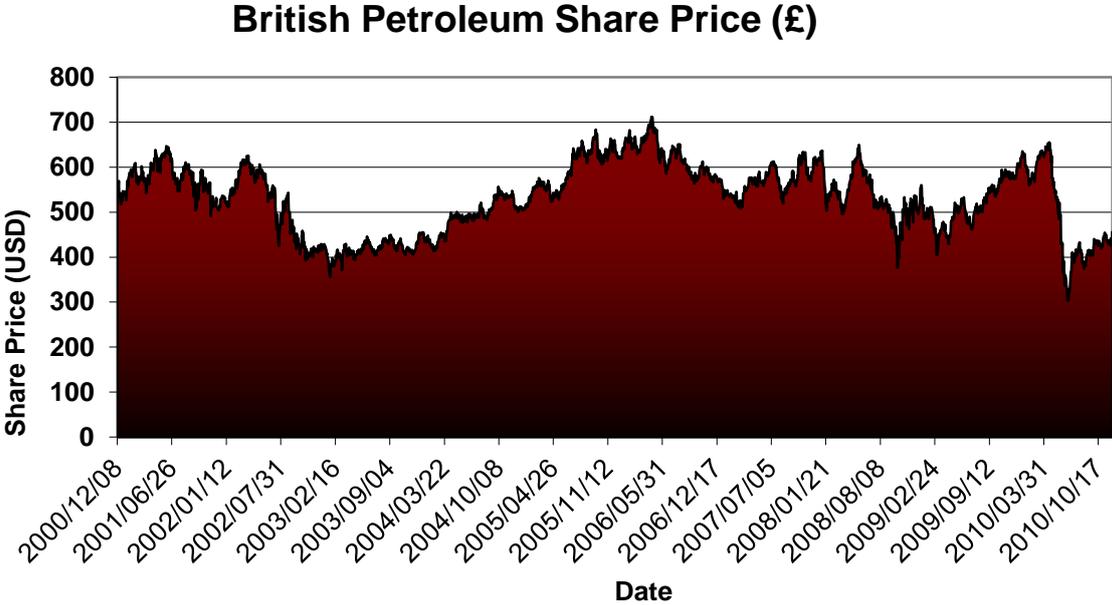
Europe and about 40 percent in the US and most of BP’s investments (67%) are devote to OECD countries.⁴⁸

BP’s Exploration/Production segment has a strong operating presence in UK, US, the Middle East, Asian Pacific locations, Russia, Norway, Canada, Latin America, North Africa, Angola, Azerbaijan, Trinidad and Egypt. They also own 50 percent of TNK-BP, a large Russian oil company with refineries and exploration assets. The gas trading and marketing activities included in this segment are foremost operating in Europe, US and Canada. BP’s other segment, Refining/Marketing, includes operations US, Europe, Australia, Southern Africa, India and China. They also posses strong ownership or shares in refineries under the brand names Amoco, ARCO, BP and Castrol.⁴⁹

4.4.4 Share price

BP’s share price has fluctuated the past ten years.

Figure 5



As seen in Figure 5, BP’s share price experienced a small drop during the financial crisis. But the greatest decrease in share price was directly after the Gulf of Mexico oil spill the 20th of

⁴⁸ BP – Annual Report, 2009 ,pg 10
⁴⁹ BP – Annual Report, 2009, pg 11

April 2010. Here the share dropped from 655 to 302 in about two months. Their current stock price is around £456 per share.

4.5 Corn product international – CPI

4.5.1 Organisation

Since 1997, Corn Products International (CPI) has been part of Delaware corporation. The company's net sales for year 2009 is approximated to 3.67 billion USD. The customers to which CPI deliver are operating in many different global industries, such as animal feed, corn oil markets, foods, beverages, paper products, textiles, pharmaceuticals and brewing industries. To develop their production and service, CPI applies worldwide production improvements and local management to better understand the specific geographical environments to add additional value.⁵⁰

CPI owns patents that are associated to both processes and products, as well as several trademarks for marketing, where none of these are essential for operations. Here they take advantage of licensing patents and trademarks from others, as well as licensing themselves. CPI is engaged in technical licensing to third parties, such as Venezuela and South Africa, in the form of management and technical advice in exchange for royalties. The licensing has resulted in a 2 million gain in income each year. These relationships also provide them with experience as well as a penetration of their products in these markets for future investment. The licensing contracts may be determined to be between one to three years but may be renegotiated and prolonged.⁵¹

Yellow dent corn is the most common raw material used by CPI and the company's US suppliers are sufficient for the company's needs. The corn price is a factor that influences the company's core business. The price can be affected by the regulations of different governments, the grain market, climate, the feeding of animals, and farmers' decisions. The corn price has also increased from year 2007 to 2008 as a result of the rise in demand from the increased use of ethanol.⁵²

⁵⁰ CPI – Annual Report, 2009, pg 2

⁵¹ Ibid, 2009, pg 5

⁵² Ibid, 2009, pg 4

CPI's international affiliations use domestic corn suppliers as well as from other areas. The corn prices in the areas of these international affiliations are affected by the same reasons as the prices in US market.⁵³ There are many substitute raw materials in the refining industry such as sugar from both cane and beets and their prices do not follow the same trend as the price of corn. Through commodity futures they hedge their corn price exposure and the amount of hedging is based on management decisions surrounding the insurance of the company's profitability.⁵⁴

4.5.2 Products

Their core business is ingredient solutions, in the form of sweeteners, starches plus other, which they sell to over 60 different industries. Their solutions are either utilised for the improvement of the support of the immune system, flavour, fat replacement, texture, glue strength or a combination of these.⁵⁵ CPI's sweetener products are high fructose corn syrups, glucose corn syrups, high maltose corn syrups, dextrose, polyols, maltodextrins, glucose and corn syrup solids, which make up for 56 percent of the company's sales year 2009. CPI's starch products and other products make up 23 percent and 21 percent of sales for 2009 respectively.⁵⁶

4.5.3 Market

CPI is engaged in an industry of high competition where some products are very similar to the one created by other organisations.⁵⁷ In the US alone, there are many competitors in the form of divisions of larger companies where they integrate their refining and operations. CPI's main competitors are Cargill, Inc., National Starch, Tate & Lyle Ingredients Americas, Inc. and ADM. Competition is also met internationally; ALMEX operates in Mexico, Cargill and National Starch operate in Brazil, and many smaller local producers compete in these areas, where they compete with factors such as availability, quality and prices.⁵⁸ Substitute products

⁵³ CPI – Annual Report, 2009, pg 4

⁵⁴ Ibid, pg 4

⁵⁵ Ibid, pg 0 (financial highlights)

⁵⁶ Ibid, pg 2-3

⁵⁷ Ibid, pg 4

⁵⁸ Ibid, pg 4

also compete with the CPI's products. The cane and beet sugar products in the market are competing with some of CPI's products, such as corn syrup with large quantities of fructose and their monohydrate dextrose. Competitors for the company's gluten meal products and corn oil are the dry milling industry products of corn and soybean oil. The substitute products prices may have an effect on the company's product prices, and thereby also affecting their earnings.⁵⁹

CPI is operating in many areas on a global scale. The South American countries in which they operate are Argentina, Brazil, Colombia, Peru, Uruguay and Venezuela. In Europe they are active in countries such as Germany and the UK, while in North America their organisation stretches from Mexico to the US and Canada. They also carry out operations in Asian/Oceanian countries, such as Australia, China, India, Japan, Malaysia, Pakistan, Singapore, Russia, South Korea and Thailand, as well as in the African countries Kenya and South Africa.⁶⁰ The areas that mostly contribute to the company's net sales are North America (≈ 62 percent), South America (≈ 27 percent) and Asia/Africa (≈ 11 percent).⁶¹

The company deals with a variety of risks, such as the prices of commodities, interest rates and foreign currency rates. These risks are handled by investing in hedging transactions such as futures in commodity, forward currency contracts, swap and options contracts, etc.⁶² For example, to minimise the market risks in commodity prices the company has invested in commodity futures and options of corn and over-the counter gas swaps to hedge these fluctuating prices. Since these commodities are part of core production, the hedging of these materials decreases their price volatility and lock in their costs.⁶³

⁵⁹ CPI – Annual Report, 2009, pg 4

⁶⁰ http://www.cornproducts.com/about-us/world_wide_locations/, 2010-11-19

⁶¹ CPI – Annual Report, 2009 pg 2

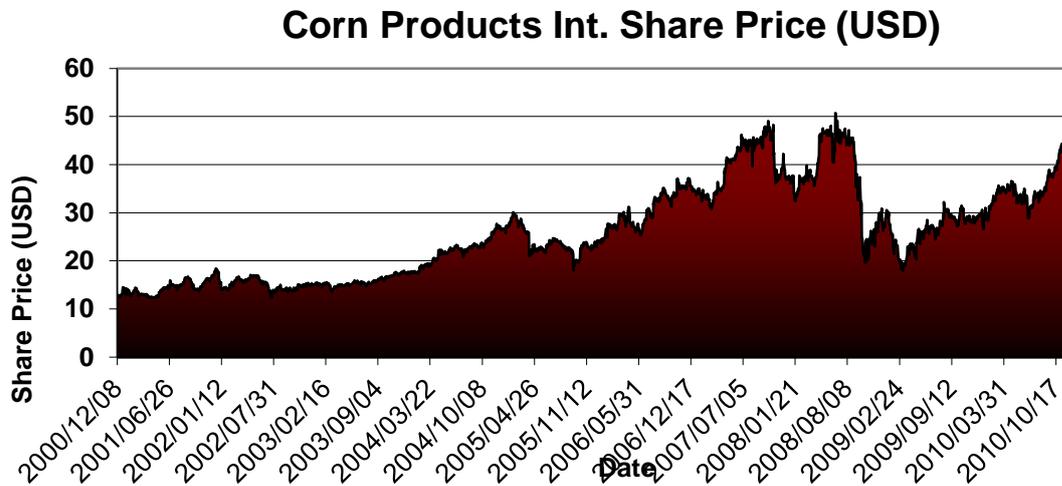
⁶² Ibid, pg 20

⁶³ Ibid, pg 40

4.5.4 Share price

Figure 6 below shows CPI's changes in share price.

Figure 6



As we can observe in Figure 6, CPI's share price suffered at the start of the financial crisis. It is now valued at around 45 USD per share and has more than doubled since the drop after the financial crisis.

4.6 ArcelorMittal

4.6.1 Organisation

Founded in 1989 by Lakshmi Mittal, then by the name Mittal Steel, Arcelor Mittal has been a rapidly growing company ever since. Thru a number of acquisitions with other companies, the first one in 1989 with the Iron & Steel Company of Trinidad and Tobago, the company has kept on growing and expanding its product base.⁶⁴

The steel producer Arcelor was founded in 2002 by a combination of three major steel producers, Aceralia Corporación Siderúrgica ("Aceralia"), Arbed and Usinor, with the target of creating a global actor in the steel industry. Arcelor operated in many key businesses, such as automotive industry, packaging, construction and general industry, which attracted Mittal Steel to place a bid on Arcelor. Arcelor grew and became the world's second largest steel

⁶⁴ <http://www.arcelormittal.com/index.php?lang=en&page=15>, 2010-11-05

producer in 2006, the same year as Mittal Steel acquired the company and became ArcelorMittal.⁶⁵

The acquisition of the company continued and in 2007 ArcelorMittal announced 35 transactions in companies all over the world. However, this expansion strategy was temporarily abandoned in 2008 due to the rough economic climate. Today, ArcelorMittal is the world's most global steel company, and also the largest steel producer in the world with an annual production capacity of over 130 tonnes of crude steel.⁶⁶

ArcelorMittal will in the near future put more focus on downstream integration (customers). With this focus come high-value products including close contact with customers that will affect the supply-chain positive thru self-owned service centres and construction support. Thru this close downstream integration, ArcelorMittal believe their market intelligence will increase which can lead to more effective service and knowledge, leveraging off new experience and products in developed countries and thereby securing their future as a world leading steel producer.⁶⁷

4.6.2 Products

Because of the many global acquisitions over the years, ArcelorMittal offers a broad production range, including both finished and semi-finished steel products. The main products include flat products such as steel plates and sheets, long products such as bars and structural shapes, tubes and pipes, and stainless steel products.⁶⁸ The stainless steel products can be seen in many products and places nearby – in the kitchen sink and cutlery, in the exhaust system of a car, streetlights in the community and in constructions all over the world.⁶⁹

ArcelorMittal aims to produce 75 percent of its raw material from its own mines, making the company almost entirely self-sufficient and hedged against rising raw material prices.⁷⁰ The company keeps on expanding its raw material base to expand the hedge. Beside the core

⁶⁵ <http://www.arcelormittal.com/index.php?lang=en&page=15>, 2010-11-05

⁶⁶ <http://www.arcelormittal.com/index.php?lang=en&page=15>, 2010-11-05

⁶⁷ Ibid

⁶⁸ <http://www.arcelormittal.com/index.php?lang=en&page=725>, 2010-11-05

⁶⁹ <http://www.arcelormittal.com/index.php?lang=en&page=735>, 2010-11-05

⁷⁰ <http://www.arcelormittal.com/index.php?lang=en&page=728>, 2010-11-05

products, steel in various forms, ArcelorMittal operates within other business areas, such as real estate, logistics solutions, advanced carbon steel and copper foils for the electronic industry.⁷¹

Since there is a global demand of the company's products and the products can be offered in different forms (finished, semi-finished) there is always a potential customer on the market. In times of unstable economic climate the demand decreases, but there will always be a demand on such things as raw material and semi-finished products. In mature economies there is a higher demand of finished products with higher value-added mix, in developing markets more demand is focused on long products and commodities. Since not all economies grow at the same pace and times of economic uncertainty not always affect the whole world economy at the same time, there is always demand for both lines of production of ArcelorMittal. Through stable long-term contracts of raw material supply with high quality and low costs the future supply and planning is secured to keep up the diversification strategy of meeting both demands.⁷²

4.6.3 Market

Since ArcelorMittal is the world's most global steel producer, their market is global and their production is spread to different continents. This results in a geographical diversification with both upstream and downstream integration to reduce risk and cyclicity. Today, ArcelorMittal is the largest steel producer in Europe, America and Africa, second largest in old Soviet and rapidly growing in Asia.⁷³ The production focus depends on the region and is also diversified between regions, with Flat Carbon Europe and Flat Carbon Americas as an example. The production focus of steel is concentrated to Europe, where 47% of ArcelorMittals steel is produced, the rest in America and countries such as Kazakhstan and South Africa, but the total production is spread over 20 countries on four continents with 65 mills.⁷⁴ Since the product range of ArcelorMittal is very broad and diversified the company has customers all over the world, which also spreads the risk within the company.

⁷¹ <http://www.arcelormittal.com/index.php?lang=en&page=734>, 2010-11-05

⁷² ArcelorMittal – Annual Report, 2009, pg 3-62

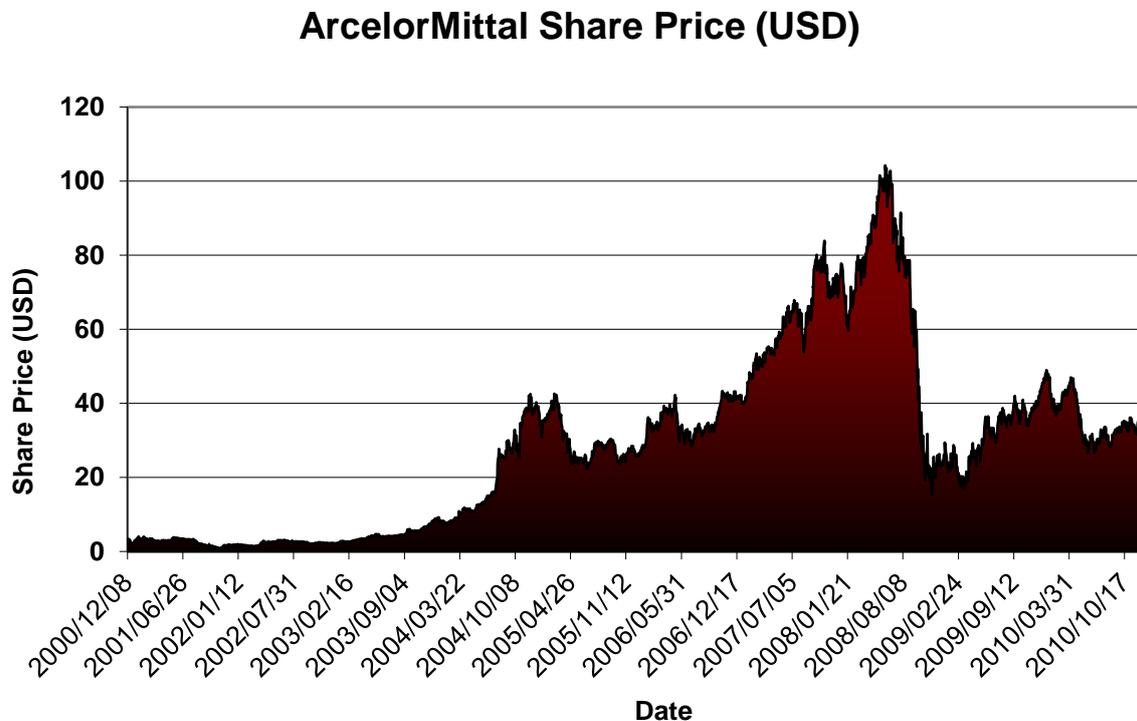
⁷³ <http://www.arcelormittal.com/index.php?lang=en&page=539>, 2010-11-05

⁷⁴ <http://www.arcelormittal.com/index.php?lang=en&page=128>, 2010-11-05

4.6.4 Share Price

Figure 7 here below shows share price fluctuations for ArcelorMittal.

Figure 7



The financial crisis had a great effect on the company's share price. It dropped from about 104.3 USD to as low as 15.5 USD in under half a year. Today it sells for around 36 USD per share, which is still an increase compared to ten years ago.

4.7 Barrick Gold Corporation

4.7.1 Organisation

The Canadian businessman Peter Munk, previously founder and owner of Barrick Resources, founded what later became Barrick Gold Corporation in 1983.⁷⁵ Due to big financial losses in the oil and gas industry, Munk reviewed the business opportunities and started to focus on gold. A number of gold mines were acquired in North America, which all showed to very

⁷⁵ <http://www.barrick.com/Company/History/default.aspx>, 2010-11-23

profitable,⁷⁶ and in the company went public in 1983 listed on the Toronto Stock Exchange and in 1987 the company was listed on the New York Stock Exchange.⁷⁷ In 1994, the company expanded its operations to go outside North America, acquiring the mining company Lac Minerals Ltd. with deposits in both North and South America. The acquisition made Barrick Resources become the third largest gold mining company in the world. The name was changed from to Barrick Gold in 1995 and the successful acquisition process continued, now all over the world, and in 2006 Barrick Gold Corporation became the largest gold mining company in the world due to an acquisition of Placer Dome, which added twelve new mines to the portfolio with advanced exploration and development projects.⁷⁸

4.7.2 Products

Today, Barrick Gold Corporation owns 25 operating mines all over the world, with a gold reserve of 139,8 million ounces of gold and a total production of 7,42 million ounces in 2009. Gold has many uses and the customers are from a wide range of industries. Gold is used in the medical industry as thermometers and interior in lasers, so mention a few things. It is also used in the space industry for space research and in computers to improve performance via gold circuitry. Beside the gold production, Barrick Gold Corporation also produces silver and copper to a lesser extent. Since the operations are very close tied to the gold and the price of it, Barrick Gold Corporation promises its shareholders an exceptional leverage to the gold price.⁷⁹

4.7.3 Market

Since gold can be used in many ways, the customer base is wide and spread around the world. The industries buying gold to the production is spread around the world and operate in very different businesses. The production of gold is globally spread as well which diversifies the Barrick Gold Corporation.⁸⁰

⁷⁶ <http://www.fundinguniverse.com/company-histories/Barrick-Gold-Corporation-Company-History.html>, 2010-11-23

⁷⁷ <http://www.barrick.com/Company/History/default.aspx>, 2010-11-23

⁷⁸ Ibid

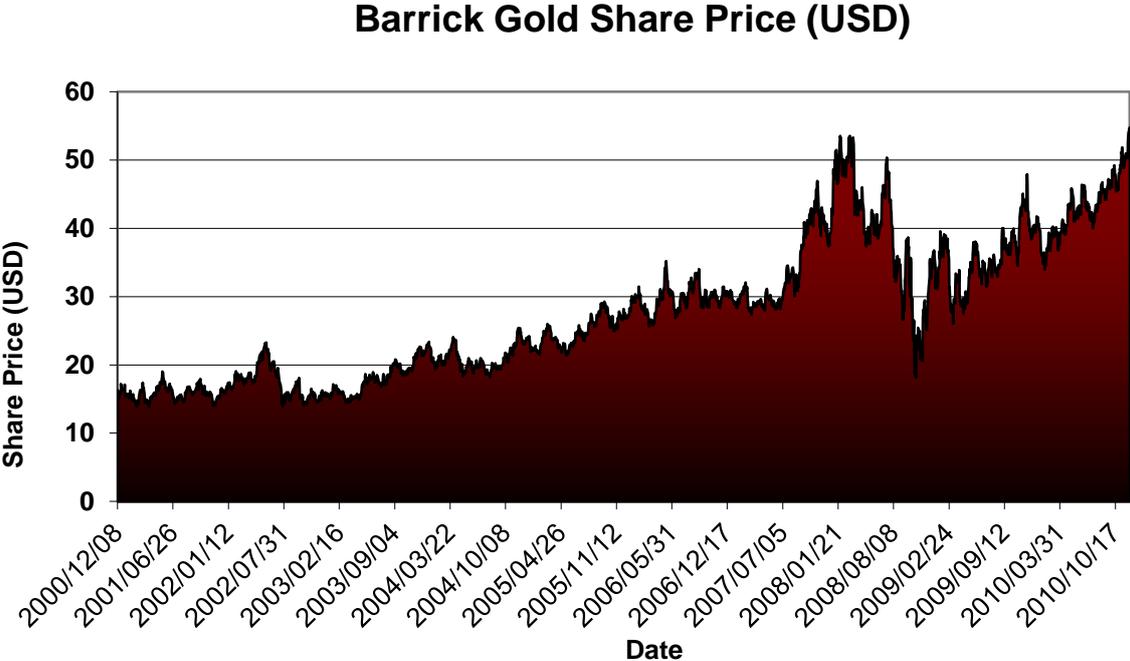
⁷⁹ <http://www.barrick.com/GlobalOperations/GlobalOverview/default.aspx>, 2010-11-23

⁸⁰ <http://www.barrick.com/Investors/AboutGold/HowGoldisUsed/default.aspx>, 2010-11-23

4.7.4 Share price

Barrick Gold’s share price has greatly increased the last ten years. Figure 8 below shows the fluctuations under this time period.

Figure 8



Their share price has also been affected by the financial crisis but has recuperated during the last two years. It is currently sold for around 53 USD per share.

5. Company risks – Different perspectives

This section presents discussions with representatives from BP, ArcelorMittal and Barrick Gold. The goal of this section is to illustrate a different perspective regarding the risks each company faces when operating in an industry where the price of natural resources affects profits. The views obtained through the interviews provide valuable information that can be used for the analysis and conclusion.

5.1 Answers from British Petroleum

Brian Sullivan is Manager of Investors Relations for North America and has a great understanding from company operations to company policy. This interview was necessary to understand the risks taken by BP and how they work hard to defend themselves from them. Brian explains over the phone that BP produces at an extremely large scale, to be more precise 400 million barrels per day. Of this production, 40 percent is natural gas and 60 percent is oil. Their crude oil produced is of average quality and is priced in accordance with the West Texas Intermediate, which is the same price of futures of crude oil on the Chicago Mercantile Exchange.

Brian clarifies that the prices of both oil and natural have a direct effect on the company's margins as well as cash flows. But when discussing how the price of these commodities affects the share price, the effects are quite different. The share price is decided by the markets belief of prices in the future. That BP undergoes a cyclical business is widely believed by the market which means that long term prices will average out. In this manner high prices now will not be regarded as such and instead BP will be valued according to the average price. The market does not trust that BP will last and for that reason the future prices are discounted by the market. When it comes to dividends paid, Brian makes clear that BP does not make any changes short term. This means that an increase of profits from an increase price of oil and natural gas does not result in a change in dividends. Brian says:

Let me explain, most typical dividend policies are that you set the level of dividend you feel is affordable and you hold it there until you see a world that has changed structurally that will allow you to increase the dividend without having to later resend it, or reduce it. It's the most common dividend policy. There are companies

*who have a variable dividend policy but they're I think unusual, and there are other companies that have a formulaic dividend posture in which they say, well whatever net income is we are going to dividend out 40 percent of it. Our position is we want to offer what we consider to be a sustainable dividend and one that is progressive.*⁸¹

In this manner only long-term changes will have an effect of the dividend payout level.

Brian explains that BP does not hedge against changes in commodity prices and instead considers this risk to be one of the main reasons behind people's decision to invest in the company. While other companies buy futures to hedge against changes in commodity prices to lock in cash flow, BP chooses not to do so and instead invest by cycle. Investments are made when prices are low and value is captured when prices are high. BP has scale, diversity and the capacity to borrow, which make the cyclical investment possible. Their business model also creates a form of natural hedge against changes in oil and gas prices. Their two divisions, upstream and downstream, are effected in different ways depending on price changes. For example, the upstream margin benefits from an increased oil price, the downstream margins tend to suffer. In this manner, a natural hedge against changes in commodity prices is created.

Brian states that through BP's performance management they forecast performance and compare it to objectives. If there are inconsistencies between the two, actions are taken, such as increased or decreasing the number investments, or slowing down or speeding up projects. The deviation of forecasted performance is usually due to changes in market conditions. This process is undergone throughout the year, and the same measures are taken under crisis but at a much quicker pace. BP also has a group of people handling the logistics of oil trade on a global scale. In this manner the costs and revenues from oil may be optimized depending on its geographical location. The same thing can be done with the trade of natural gas and power.

Brian clarifies that there are certain risk BP faces that are not hedge-able and there are other risks that are. One of the risks BP hedges is the cost of insurance. If the company would

⁸¹ Telephone interview with Brian Sullivan, Manager of Investors Relations for North America at British Petroleum, 2010-12-01

purchase insurance, it would have to be bought at too high a price. Instead, BP is self-insured, except for insurance such as workman's compensation which is compulsory by law. BP's self-insurance is possible due to their large scale. This is not possible for smaller companies who cannot afford this risk exposure. Other risks that are hedged are risks related to foreign exchange and interest rates.

The risks that BP cannot hedge against are strategic risks. These risks include their assets being expropriated or nationalized by a foreign government, the success of exploration projects, but can also be operational risks. Operational risks can be anything from the time it takes to run operations to the product quality and financial instruments cannot solve these risks.

On the question of diversifications importance to BP, Brian answers that diversification is used in different dimensions. However, diversification to minimize return volatility is not used, for they believe their investors want to be exposed to the risk of crude prices. On the other hand, value chain diversification is exercised. Their vertical integration, from exploration to distribution, allows BP to gain value through commodity price changes, where upstream or downstream operations capture this value depending on the price. The fact that BP is an integrated all company is important for investors, as well as BP's fairly low beta value when compared to other companies in their market. Another form of diversification performed by BP is their participation in two different markets, oil and natural gas. In this way they tap into the global market through oil and the regional market through natural gas, and rarely do these commodities' prices follow the same course which makes this diversification quite beneficial for the company. Geographical diversification is also part of BP's operations. Through having global operations, they spread the risks for natural catastrophes from happening to their whole supply. In this way all eggs are not put in the same basket.

Looking towards the future, Brian explains that new technology is being developed with the intention to increase the company's diversification. About 1.5 billion or less is spent a year on alternative energy development, which can be a great potential for further diversification. BP also has inherited large amount carbon intensive assets and is developing new technology to be able to utilize them for its real value, and in so doing, diversifying their product line. Another project for diversification is the increased use of bio-fuels. BP already has all the

building blocks required to refine and distribute and can take advantage of these assets to maximize their value in their future.

5.2 Answers from ArcelorMittal

To obtain some answers, an interview with Hetal Patel was held over the phone. He is the General Manager of Corporate Finance & Investor Relations for ArcelorMittal's European operations and has a great comprehension of the risks taken by the company. Hetal explains that the dominant factor that drives the global steel price is China, since they have around 50 percent of global consumption. Even though China has such a great effect on the global steel price, ArcelorMittal has not entered this market.

The gross margins of ArcelorMittal are related to the costs, where a premium must be charged for the steel price. The size of the margin depends on the grade of the steel sold, low end or high end. While low end products, such as billets and bars, give a much lower margin than the high end products. This is because high end products are composed of highly specialized steels, and in that manner a higher price can be established. The downside is that there is less demand for high end products. In other words, the margins are decided by different demand cycles of their products. Their costs are directly affected by the price of iron and coal, and the prices of these raw materials are currently very high. This is because they are presently priced per quarter, as opposed to being price annually as it has been in the past. In the past there has also been a volume over price strategy, where steel companies produced great amount to cover costs. This strategy has now turned into a price strategy where their volumes have decreased to 70 percent due to a lack in steel demand. The reduction of production increases the company's margins by decreasing the amount of fixed costs, and making their price strategy more beneficial.

In regard to the company's stock price, Hetal considers the margin increase to generate cash flows, and in so doing, indirectly affecting the share price. Hetal explains:

So other efforts that ArcelorMittal are doing is we are looking at driving costs out of the company, we are becoming more leaner, more rational reducing our head count and we are going through a stringent SGNA program reducing costs wherever we can and we have a management gains plan in place whereby we are

*looking to shave off five billions of costs over five years. Currently we manage three billion, our cost reduction; we still have a further two billion of cost reduction. Again, these are positives for our investors; they see that the company are making efforts to reduce its cost base, maintain its profitability, going forward in the future.*⁸²

In this manner, investors will notice company efforts to improve profitability. The dividends paid by ArcelorMittal are at the moment 75 cents per share. This value is due to their dividend policy of maintaining assets and growth opportunities as well as considering the expenses for acquisitions and the generation of cash flow before their dividend payout.

Hetal clarifies that ArcelorMittal does not take any actions towards the hedging of commodity prices. On the other hand, their lower production level maintains equilibrium of steel prices, even under crisis, as well as focusing on the three C's, customers, costs and competitiveness. In this way they keep up their margins under unstable times. What they do hedge against is different exchange rates. Since they operate on a global scale, they must lower the risks for change in rates of currencies by placing their debt in different countries. Other hedging is in place, such as decreasing the risks of change in the price of raw materials through backward integration.

Hetal explains that their main forms of diversification are product and geographical diversification. Their great diversification of steel products has made reduced risk during the yearly cycle, since some products are wanted during different periods. The same goes for their geographical diversification where different markets undergo different cycles of demand over the year as well as having a leadership position in certain countries. In this way, diversification is highly beneficial to the company.

Looking towards the future, ArcelorMittal is geographically focusing mostly on the BRIC-countries for further growth. Of these countries, plans are already made to develop sites in India as well as they want to enter the Chinese market where there is the greatest potential for growth. And for their product diversification, development of new types of steel for the

⁸² Telephone interview with Hetal Patel, General Manager of Corporate Finance & Investor Relations at ArcelorMittal 2010-12-06

automobile industry with different characteristics, such as resilience and lightness, are already taking place. Their main focus in this area is on carbon steel to further diversify their product line.

5.3 Answers from Barrick Gold

We contacted Susan Muir to obtain some answers of the risks taken by Barrick Gold and how they defend from these risks. Susan Muir is the Senior Director of Investor Relations at Barrick Gold and has vast knowledge of the company's operations and strategy. Susan explains that the price of gold directly influences the company's margins. This includes net income and cash margins (gold price minus total cash costs). The cash costs have been stabilised, and occasionally decreased, during the last few years while gold prices have increased, and in so doing, increased these margins. She also states that:

There is no direct correlation between margins and share price, but as we have been able to contain or decrease cash costs, grow our margins and deliver earnings that have beaten consensus for the past six quarters in a row, our share has begun to outperform all of our peers.⁸³

In other words, the increase of net income has not affected the company's share price but its affects will be shown in the future.

Susan clarifies that no actions are taken by Barrick Gold to hedge the risks from change in gold prices. Their actions are instead taken to hedge from other costs, such as diesel, propane, copper and the Australian dollar, that affect the company's margins, which are also continuous as a pre-emptive action for crisis. By hedging from these risks, Barrick Gold's earnings are more expected as well as less volatile.

Susan explains that there are several other risks companies operating in the gold industry must face. These are composed of operating risk, geopolitical risks, permitting risks and social risks, which can for the most part be connected to government regulations, technology and chance. Susan believes that these risks are not a great threat to the company for Barrick Gold

⁸³ Written response to interview question by Susan Muir, Senior Director of Investor Relations at Barrick Gold 2010-11-29

has an extensive knowledge of risk management as well as size, scale and CSR programs. In this way, the company can easily meet estimates and expectations.

The spreading of risks through diversification has in the past not been the main focus of the company according to Susan. Susan states that:

...our preference is for long life mega-assets like the 2 we are building currently and the other projects in our pipeline which will afford us the ability to get off the treadmill of having to constantly replace production and which allows us to be disciplined and patient with respect to acquisitions. However these long life assets increasingly are polymetallic in nature (i.e. gold-copper porphyries) hence it is possible that we will end up with some increased copper content, but we are not actively looking for base metal assets.⁸⁴

This means that although diversification has not been an issue in the past, the company is currently building mega-assets and other projects as a long term benefit to production replacement. These investments will in the future increase the use of copper in production, and in so doing increasing the company's diversification.

⁸⁴ Written response to interview question by Susan Muir, Senior Director of Investor Relations at Barrick Gold 2010-11-29

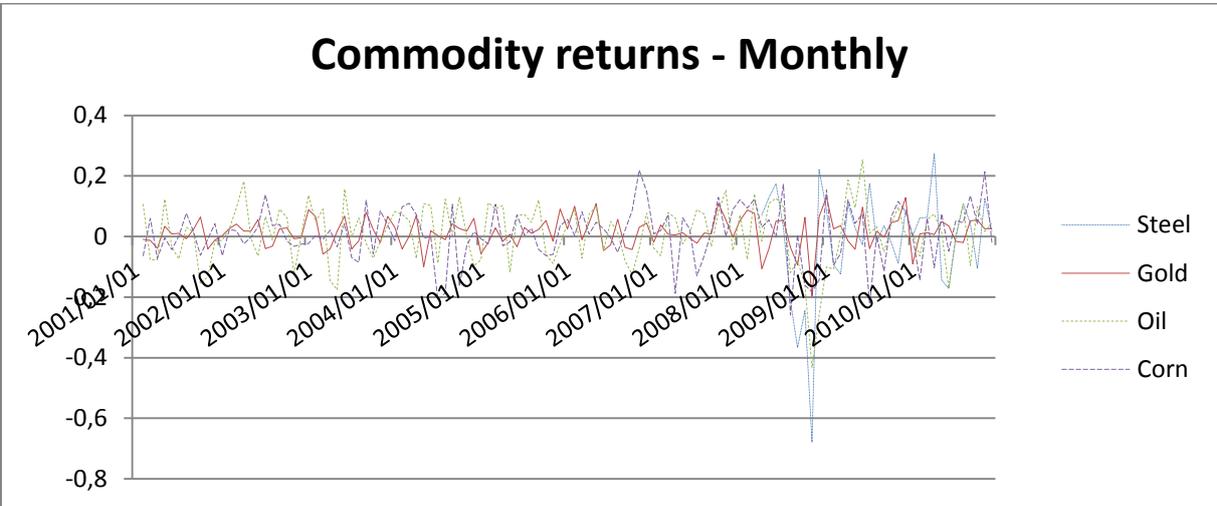
6. Results

The results obtained from applying different theories to the data acquired from Datastream are presented in this chapter. Analysis of these results will also be included for the ease of observation and to avoid repetition.

6.1 Commodity returns

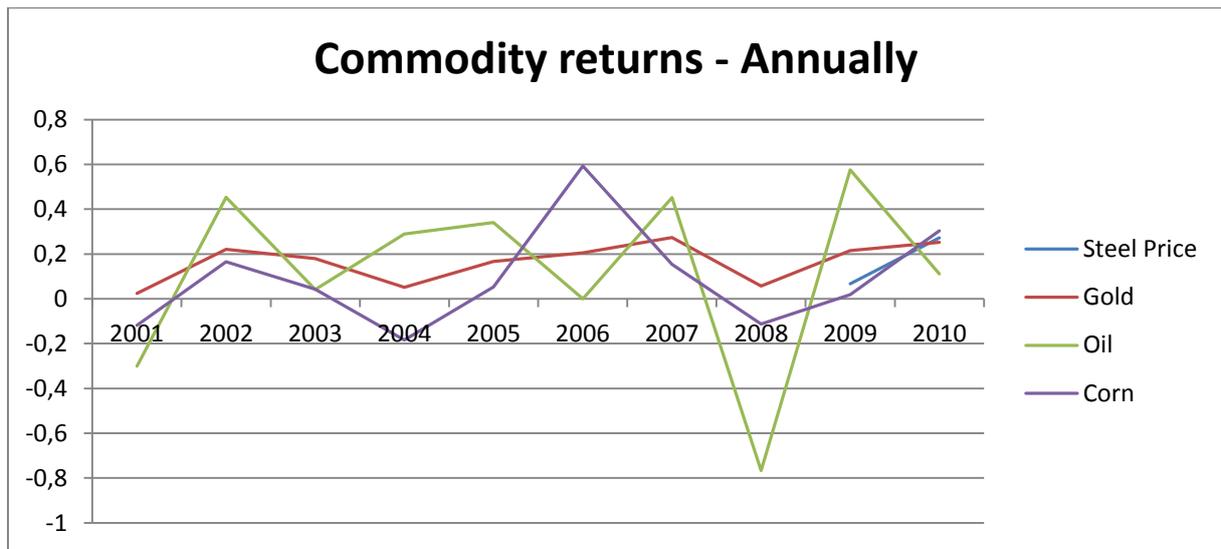
Figure 9 below shows the patterns of monthly returns for each commodity.

Figure 9



Since steel entered the commodity market the 25th of February 2008, these are the only statistics we can observe. Not much can be deducted through observation, which is why an alternative has been provided with annual returns.

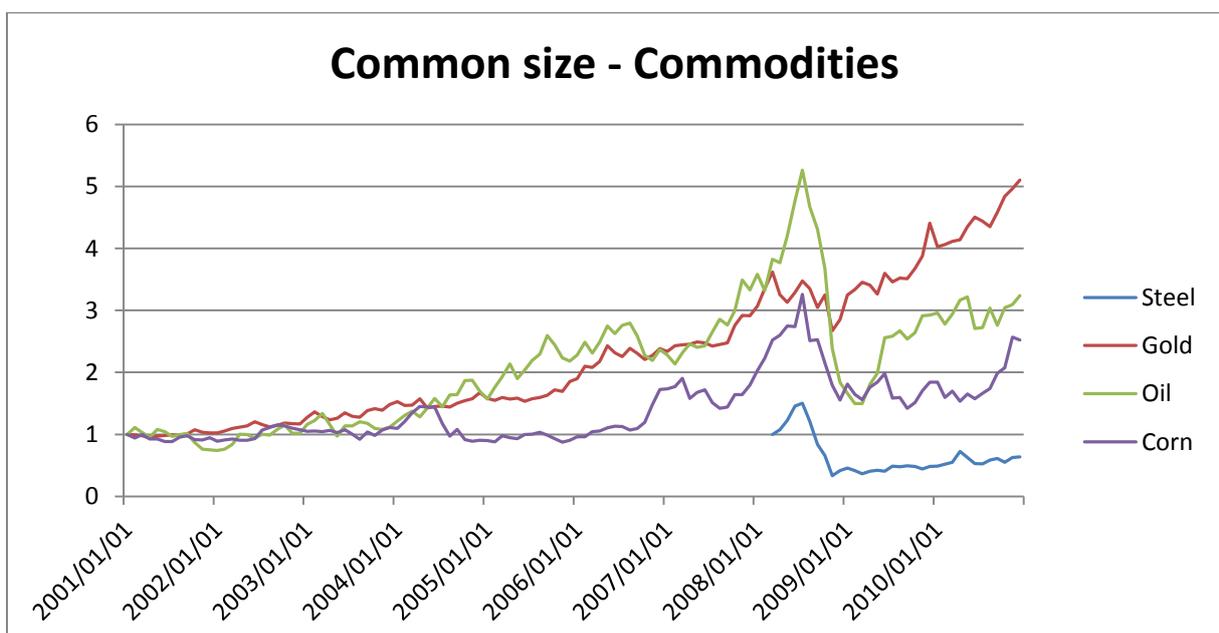
Figure 10



In Figure 10 above the returns from the different commodities are easier to interpret. All except steel since now only two values for its returns have been calculated. The general trend for most commodities is the drop in 2008. The gold returns have not had a negative return during the last ten year in comparison with oil and corn.

To illustrate the change in price for all commodities we have made a common size graph, where their change in price is compared to their price ten years ago. In this way we can observe their percentile change and compare them to each other.

Figure 11

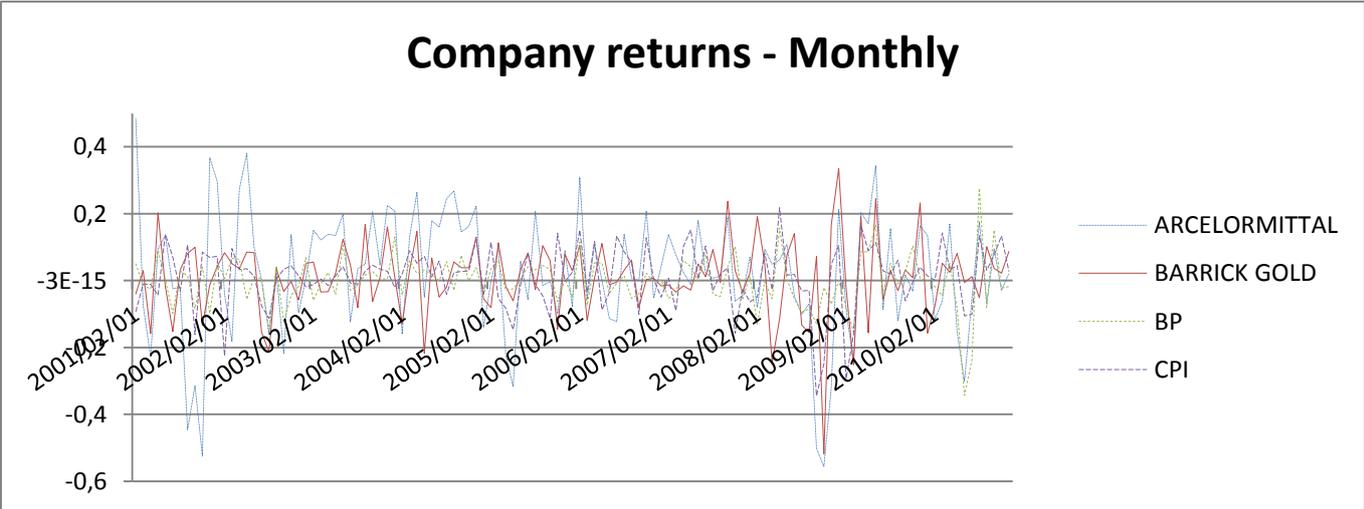


As in the previous graphs, there is still a problem comparing the commodities to steel because of its late pricing. We can observe that the rest of the commodities can easily be compared in Figure 11. The highest peak was in the oil price just before experiencing a drastic drop in 2008. Gold is the only commodity that has had a quite steady rise and is presently the commodity with the greatest price change.

6.2 Company returns

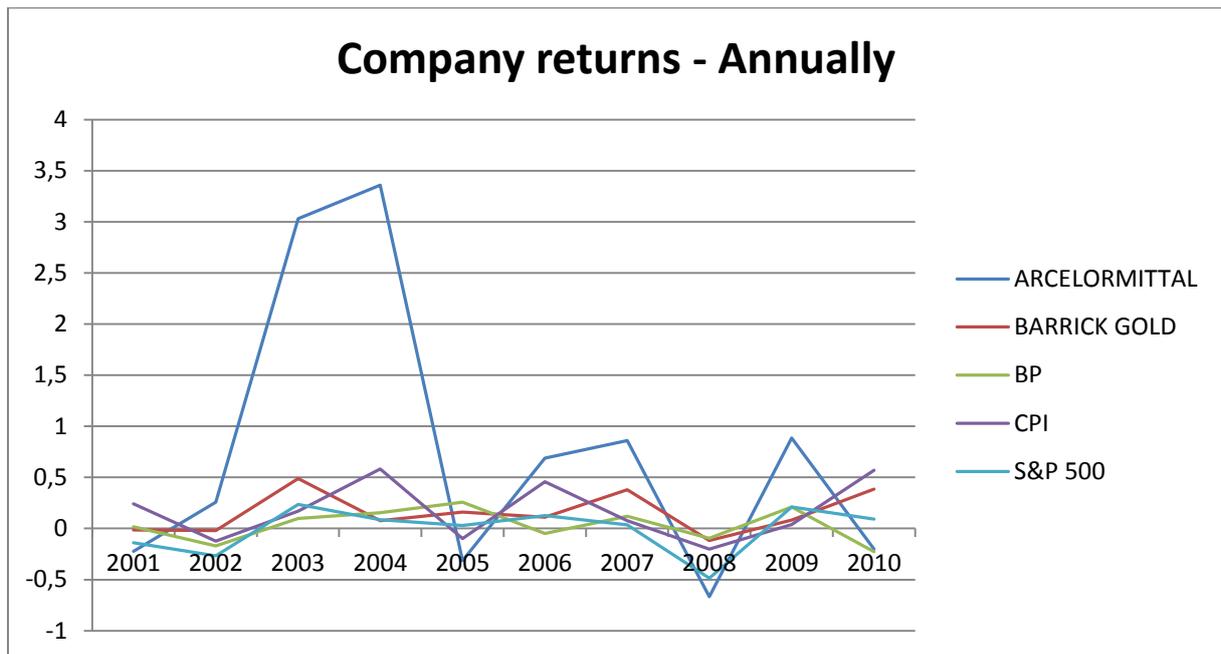
The returns from the different companies chosen are plotted on a monthly basis in the following graph.

Figure 12



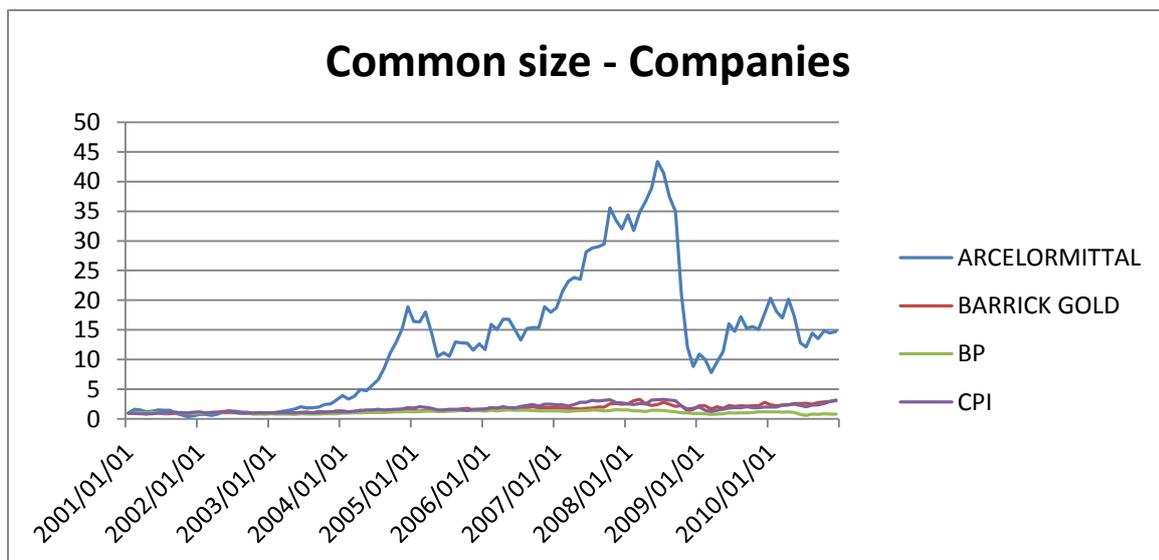
Just like the previous graph for commodities, Figure 12 is just as vague. The returns have greatly fluctuated and it is impossible to distinguish between the companies. By plotting returns annually with dividends included, a more observable figure is created.

Figure 13



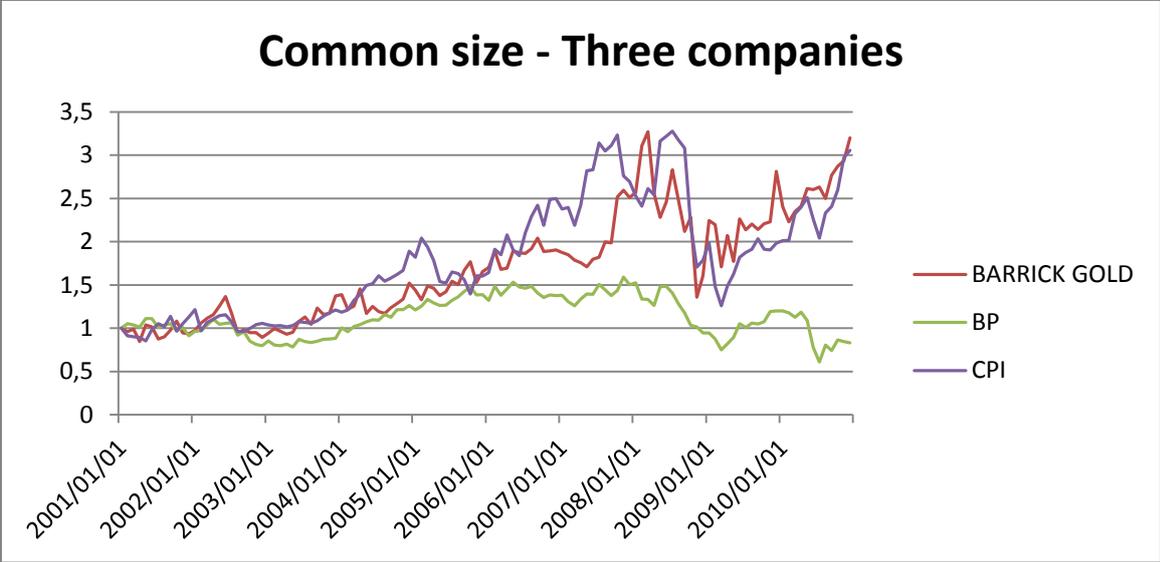
In Figure 13 we notice the extremely high returns for ArcelorMittal between 2002 and 2004. Apart from ArcelorMittal, the rest of the companies have quite normal returns. Both Barrick Gold and CPI have given about 50 percent returns and have this present year given the highest returns, while BP and ArcelorMittal have generated negative returns as well as below S&P 500. To illustrate the share price changes, a common size graph (Figure 14) to compare the companies to each other is presented.

Figure 14



In Figure 14 we can observe the extreme price change ArcelorMittal has undergone. This makes it harder to examine the other companies' change in share price. The remaining three companies can be noticed in the following graph.

Figure 15



In Figure 15 we can see that both Barrick Gold and CPI have had a positive change the past ten years when compared to BP. They have both currently had about the same percentile change while BP has had a negative change.

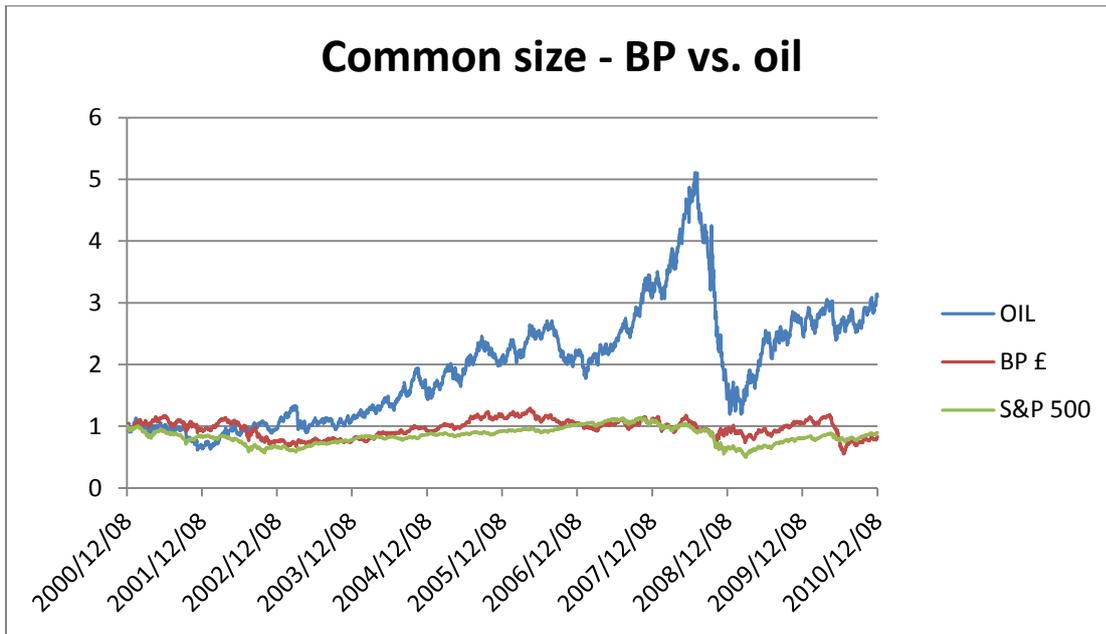
6.3 Regression and common size

To compare companies to their respective commodity, a common size graph and a regression analysis have been presented for each. Through the common size we can observe if the price of the company's share and the commodity price follow the same pattern. The regression analysis provides information regarding the two factors' correlation, determination coefficient and a linear equation explaining their relationship.

6.3.1 British Petroleum vs. Oil

In the following Figure 16, we have plotted the common size for BP's share price, the price of oil and S&P 500.

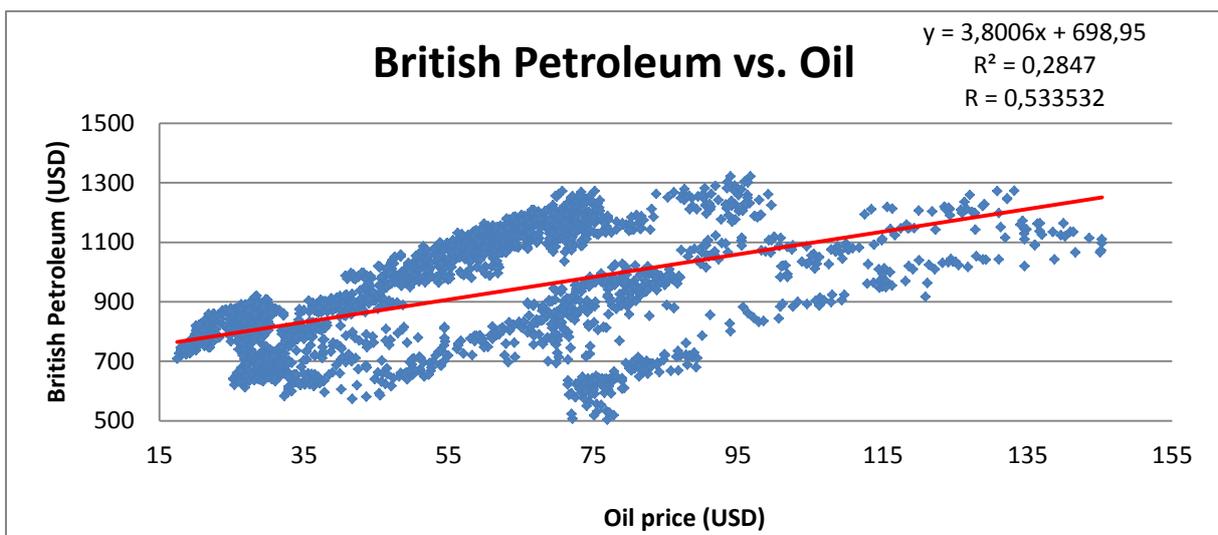
Figure 16



BP's share price does not seem to follow the same trend as the price of oil. Instead it fluctuates in the same way as S&P 500. Here the price of oil has a much greater positive change than BP, even with the great drop in 2008.

According to the linear equation below, the share price is positively affected by an increase in commodity prices.

Figure 17



The statistical correlation (R) between the prices is about 53 percent that explains how well one factor affects the other. The determination coefficient (R²) is about 28 percent, which relates to how likely our future prediction might be through this model. Since this factor is low, future predictions are not that likely to correspond.

Concerning the company's vertical diversification, BP operates within two different business segments, Exploration/Production and Refining/Marketing, where the Exploration/Production segment consists of both upstream and downstream activities. This indicates that BP is vertically integrated, which gives the company control over their supply and distribution channels as well as lowering the company's transaction costs.

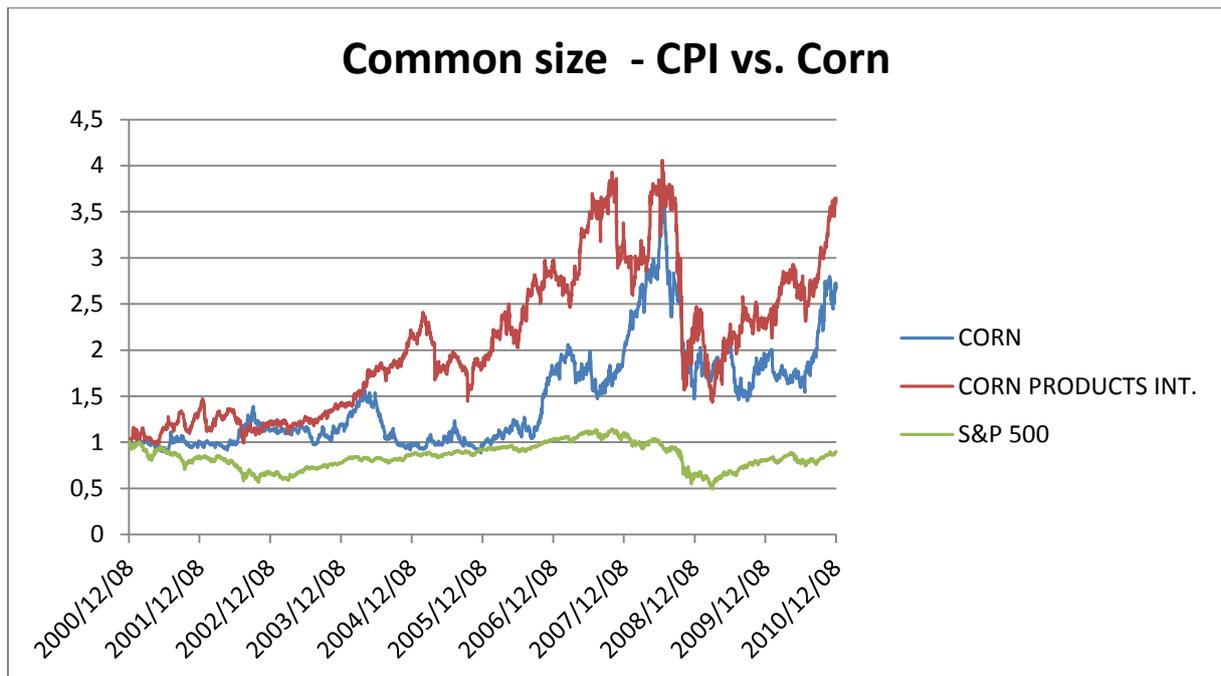
The reason behind BP's low level of correlation with the oil price is to a certain degree caused by the company's horizontal diversification, where not only oil is in focus, but also their investments in natural gas. In this way scope advantages are exercised between both products. As Brian Sullivan pointed out in the interview, BP undergoes a cyclical business, which averages out their long term prices and affects the company's value. Rarely do oil and gas prices follow the same pattern, which helps this process. By operating with two different products they create a natural hedge against changes in commodity prices, but this also affects their stock performance. For this reason BP's share price does not follow the oil price pattern, but instead tends towards the market's performance. They do however hedge against exchange and interest rate risks.

BP's stock price was hardly affected at all compared with the oil price during the financial crisis. This is due to their natural hedge, which has helped them through tough financial times. However, instead of experiencing depreciation in stock price during that period, they suffered great losses during the Mexican Gulf misfortune.

6.3.2 Corn Products International vs. Corn

As seen below in Figure 18, the share price of CPI has had a greater positive change than the price of corn.

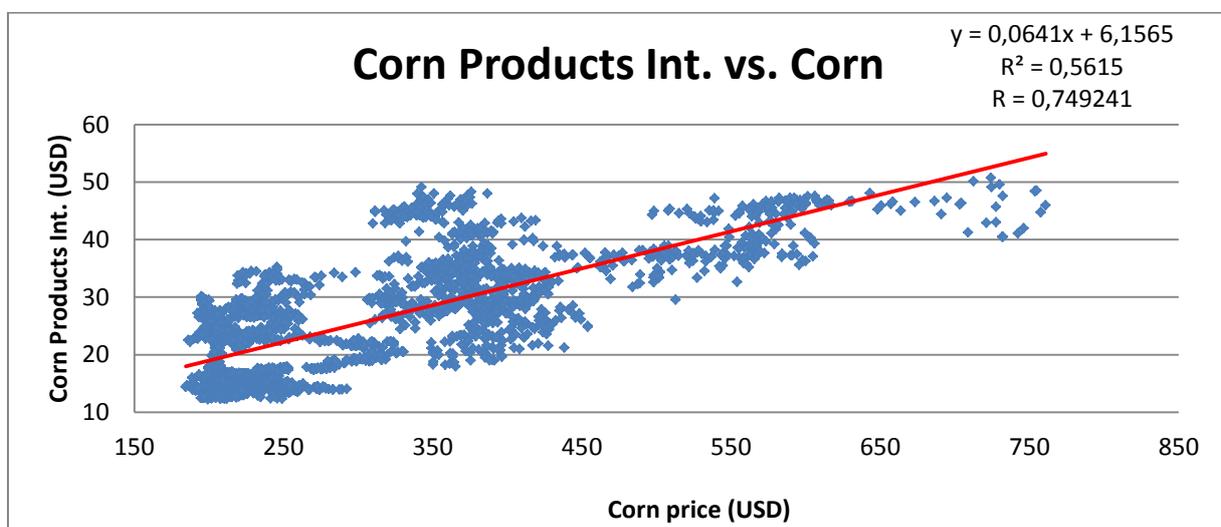
Figure 18



Also noticed, is that both the CPI share price and the corn price deviate from S&P 500. We cannot see that they follow similar fluctuations, but they have both risen the last ten years. Even with this difference, both prices experienced a great decline during the financial crisis. Since this time period, CPI's share price has increased at a higher rate than the corn price.

Through the regression analysis (Figure 19) we obtain a positive linear equation. This means that the price of the CPI share will increase as the price of corn rises.

Figure 19



The share price of CPI and the price of corn have a correlation of almost 75 percent. Their determination coefficient is not high nor low and does not give any accuracy for future predictions.

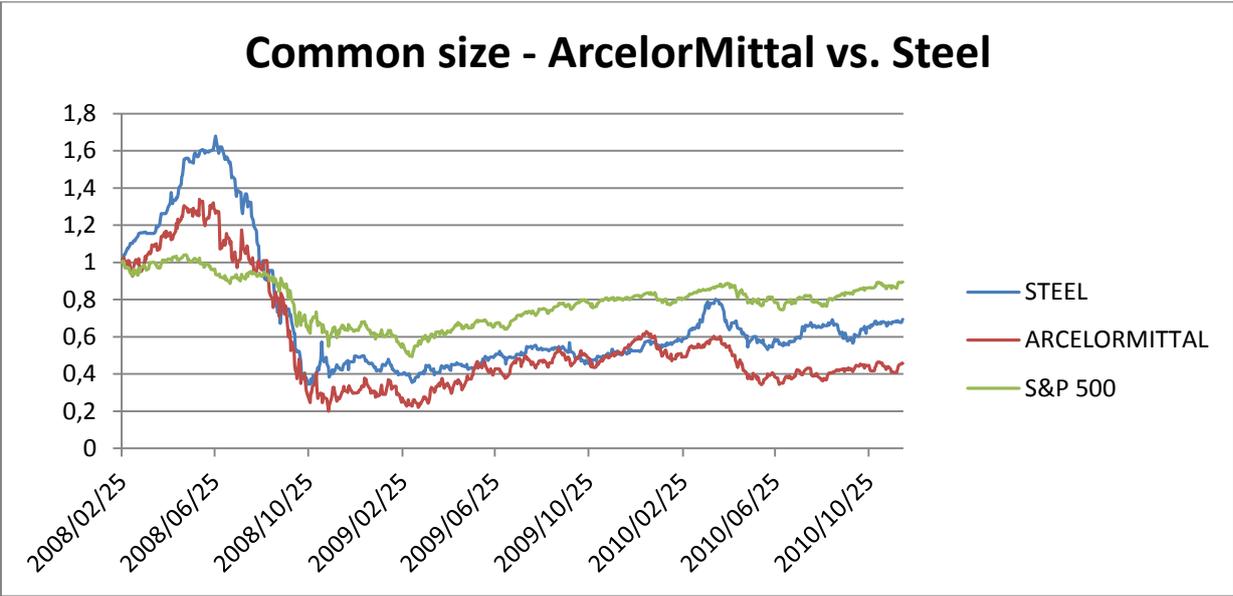
CPI does not correlate with the corn price because of their lack of vertical integration. By not having their own cornfields and corn production facilities, they have to purchase corn from different suppliers. Therefore they are not vertically integrated and instead they focus on the refinement of supplied raw materials. This requires them to hedge from changes in corn prices through future and option contracts to lock in costs. In this way they do not benefit from an increase or decrease in corn price.

The stock price is also affected by horizontal diversification, but in another manner. CPI has a broad product range covering many different corn based products. The demand of these products is covered by diverse markets, with different characteristics. In this manner, CPI is not dependant on a single market, but on several markets with a large accumulated demand to increase their value. According to the Ansoff matrix (Table 1), the company has undergone both a market development by adapting their products to new markets, such as their specific sweetener products to more demanding customers, as well as diversification with new products into new market, such as starches. This form of growth has resulted in value creation noticeable in their stock performance. The amount of product lines in operations creates a form of hedge for the company.

6.3.3 ArcelorMittal vs. Steel

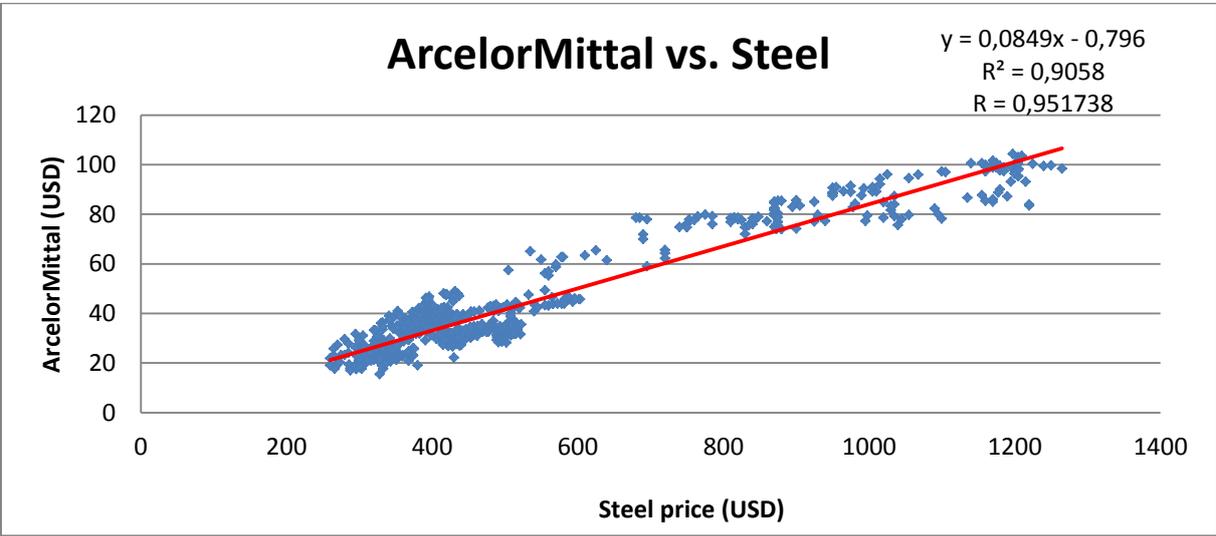
Since steel has only been sold on the market as a commodity from the 25th of February 2008, we can only compare the values from that time forward. Even though we obtained steel prices a much smaller period of time than intended, we still have over 700 values, which should be enough make a good comparison. The common size graph below, Figure 20, shows us both prices closely together, even experiencing the same drop in 2008.

Figure 20



As observed in the regression analysis, Figure 21, the linear equation is positive and the correlation between prices reaches more than 95 percent. The high determination coefficient of about 91 percent suggests that future outcomes will be quite accurate to the linear equation.

Figure 21



The high correlation between ArcelorMittal and the steel price is due to two factors, vertical integration and a non hedging policy. This creates a close relation with the underlying commodity. Since ArcelorMittal is now aiming to have an iron ore self-sufficiency level of 75 percent, they are tending towards being a fully vertically integrated company, where the steel price directly affects their own revenues. Their non hedging policy creates a situation where

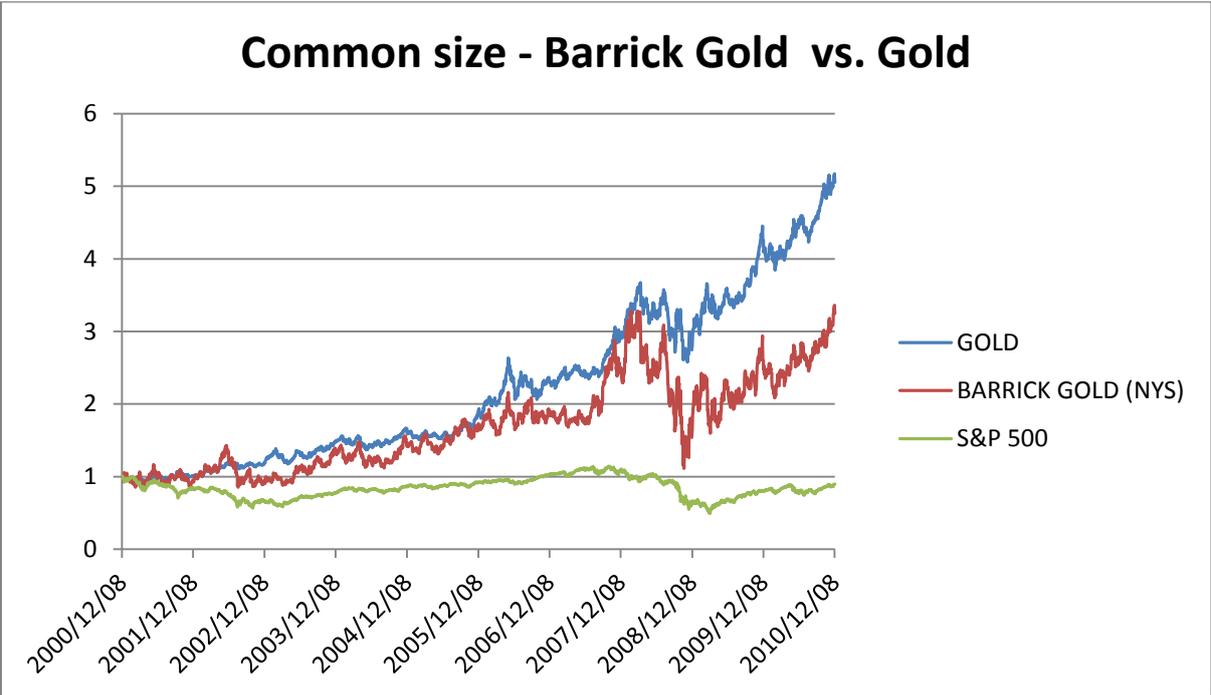
they are exposed to the risks of changes in steel price but decide not exercise this option because of increased costs. Hetal Patel explains in our interview that high prices are charged for ArcelorMittal's high end products because of an increased price for both iron and coal. In so doing, this also decreases the demand for these products, which has led to a price strategy where ArcelorMittal has decided to produce at 70 percent of its capacity to keep high prices and lower costs. This is yet a reason to avoid hedging from drastic price variances. Since ArcelorMittal is a global company, they focus instead on exchange rate hedging to reduce the risks of their global transactions.

ArcelorMittal embraces horizontal diversification through offering line of different product, a broad range from basic to more complex solutions. This gives the company an advantage when supplying global markets, since different markets change in demand at certain points in time. ArcelorMittal has according to the Ansoff matrix practiced diversification, market development and product development by developing new products to new markets, different products to existing market as well as adapting their products to new markets. These forms of diversification secure further growth in the future.

6.3.4 Barrick Gold vs. Gold

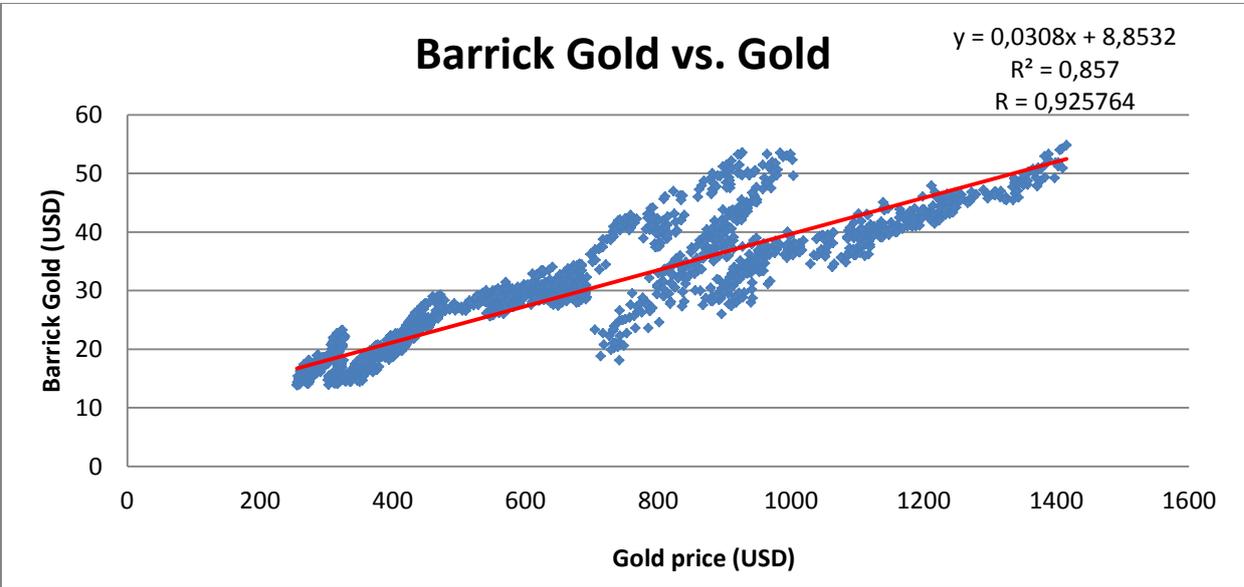
Through the common size graph, Figure 22, between Barrick Gold's share price and the gold price, it is noticeable that they tend to rise and drop in a similar manner. As seen in the following graph, both prices follow the same pattern and have, as a percentage, increase much more than S&P 500.

Figure 22



The positive linear equation implies that as the gold price rises, so will Barrick Gold’s share price.

Figure 23



The correlation between the two prices is almost 93 percent. Combined with a determination coefficient of about 88 percent, it suggests that the linear equation is a relatively accurate prediction for the future.

The underlying reason behind the high correlation between Barrick Gold’s stock and the gold price is because of the company’s vertically integrated business. The vertical integration makes it possible for the company to control its elements in the supply chain. This affects the company’s revenues directly since they own their own mines as well as not hedging against changes in the price of gold. Barrick Gold does however hedge against variable costs and currency to some extent. These hedges make it possible to foresee expected earnings and decrease the company’s underlying risk. The anticipation makes it easier for the company to focus on earnings instead solely on covering its costs.

Barrick Gold is not particularly diversified since they do not have any variety in their product line. On the other hand, they do produce silver and copper to a lesser extent but cannot consider this to be at a moderate level. This low level of diversification results in close correlation between their share price and the price of gold. At the moment, Barrick Gold is heavily investing in future copper production in the form of diversification according to the Ansoff matrix. This may also be considered as a horizontal diversification since it is still within the company’s know-how.

6.4 Volatility

The volatility of commodities, companies and funds are given in the following table:

Table 3

	Commodities				Companies			
	Oil	Corn	Steel	Gold	BP	CPI	Arc. M.	Barr. G.
Average Return	0,00043	0,00038	-0,00050	0,00062	-0,000038	0,00050	0,00090	0,00045
Daily VAR(R)	0,00064	0,00035	0,00093	0,00014	0,00035	0,00055	0,00063	0,00070
Daily σ	0,025	0,019	0,030	0,012	0,019	0,023	0,025	0,026
Annual σ	0,40	0,30	0,48	0,19	0,30	0,37	0,40	0,42

As we can see in Table 3, gold has the lowest volatility for the commodities and BP has the lowest for the companies. Even though BP has a negative average return, its volatility is still less than of its associated commodity, oil. ArcelorMittal is the only other company that has a lower volatility than its corresponding commodity, even though CPI is not far away. On the other hand gold is less than half as volatile as Barrick Gold that has a standard deviation of 0,42. There is no trend that the companies are less volatile than their corresponding commodities, nor the other way around. Both gold funds have a higher volatility than the commodity, but have a lower volatility than Barrick Gold. This can be explained by the high level of portfolio diversification within the funds, which lowers the risks and smoothes out their fluctuations. On the other hand, the First State Global Resources Fund has the lowest volatility after gold as a commodity. This is also due to its high portfolio diversification of many different types of commodities within its holdings.

7. Analysis

In the thesis' analysis, arguments surrounding the commodity investment alternatives are presented, including a more thorough argument of stock and commodity correlation. The aim is to summarise and compare the selected options available for investment.

7.1 Stock and commodity correlation

From the results, it is noticed that there can be a high level of correlation between stocks and commodities. Even though we have obtained different results for each company's correlation with its underlying commodity, a specific pattern can be perceived and discontinuities in this pattern can be explained. To obtain a high correlation it seems the companies must follow certain criteria.

7.1.1 Criteria

The criteria for companies to obtain a high correlation between its share price and its underlying commodity are the following:

Table 4

	Criteria	Example
1	Vertical integration	A gold company owns its own mines
2	Low diversification	A company only diversifies within its main commodity core business
3	Non hedging policy	The company does not buy futures to lock in their costs

Vertical integration within a company implies that the company must own a source of their underlying commodity. This is important for a high correlation since without owning a source of their underlying commodity, the company's revenues will not be aligned in accordance to their underlying commodity price. This would further lead to a low correlation between the commodity price and the company's share price.

The criteria of low diversification refer to a form of market development, according to the Ansoff matrix (Table 1). An example of this is ArcelorMittal, who adapts their products to

different customers, low end and high end steel. This adaption of products allows the company to have steadier revenues during market recessions and economic booms. The steady sales of the underlying commodity will lead to a greater alignment between the markets demand for the product and the company’s sales.

Non-hedging policy is an important criteria to follow, since through hedging against the underlying commodity price through the purchase of futures, the company cannot gain from a rise in the underlying commodity price. Hedging also leads different costs, such as transaction costs and administrative costs. Note that this criterion does not refer to hedging against neither currency nor geographical diversification.

To observe how the four chosen companies follow these criteria, the following table is presented:

Table 5

Company\Criteria	Vertical Integration	Low Diversification	Non Hedging Policy
British Petroleum	X		X
Corn Products Int.		X	
ArcelorMittal	X	X	X
Barrick Gold	X	X	X

British Petroleum has its own Exploration/Production business segment, which follows the vertical integration criteria through oil and natural gas rig ownership. They also have a non hedging policy against oil and natural gas prices, for they believe that investors actually want this exposure to pricing risks, as pointed out by Brian Sullivan. On the other hand, British Petroleum does not diversify through market development, adapting their product to satisfy different customers; instead they diversify into a separate industry, natural gas, which is 40 percent of their entire production. This is considered to be diversification in the Ansoff matrix (Table 1), in the form of horizontal diversification, and is not regarded as market development, which is needed to follow this criterion. For this reason, British Petroleum does not have a high correlation with the oil price.

As it can be observed in Table 5, Corn Products International follows the low diversification criteria through market development by adapting their product. On the other hand, they do not follow the vertical integration criteria, nor do they follow the non-hedging policy criteria. This is because they do not own their own cornfields to have a steady corn production and gain revenues from an increase in corn price. This means that they must buy corn on the market, which results in a reverse effect where an increase in corn price would lead to higher costs and not increased revenues. The exposure to this risk also affects the third criteria of a non-hedging policy. This is because they do not want to have a future cost increase and therefore hedge against it to know their future corn purchasing costs. By not following these criteria, they do not correlate with the corn price.

Both ArcelorMittal and Barrick Gold follow these criteria, as noticed in Table 5. These companies both own mines for their respective underlying commodity, and in so doing follow the vertical integration criteria. They also follow the criteria of low diversification through adapting their products to different industries. Their non-hedging policy regarding underlying commodity prices is also in accordance to the third criteria. Through following these criteria, both companies have a high correlation with their underlying commodity price.

7.1.2 Market expectations

As pointed out by our interviewees, above all, the share price is dependent on the market's expectations of future cash flows. The future cash flows are discounted to its present value, which together with non-operating assets gives us the company's enterprise value. To calculate the equity value of a company, debt and debt equivalents are subtracted from the enterprise value, which is then divided by the undiluted shares outstanding to obtain the share price. The concept of market expectations as setting the price of the share contradicts our result of obtaining a high correlation and predictability.

An explanation for this correlation phenomenon is that the effective market adjusts their future expectations depending on the demand on the commodity market. For example, if the demand for steel increases on a global scale, this means that the demand for a steel company's products has increased as well. This raises the price of steel today and the effective market's expectations of higher future cash flows for the company follow. This is yet an argument for a

high correlation between the company’s share price and the price of its underlying commodity.

7.2 Return

In the results section, we can observe the average returns for each company and commodity for a period of ten years, with the exception of the steel price.

Table 6

	Commodities				Companies			
	Oil	Corn	Steel	Gold	BP	CPI	Arc. M.	Barr. G.
Average Return	0,00043	0,00038	-0,00050	0,00062	-0,000038	0,00050	0,00090	0,00045

To illustrate and compare the average returns of each company versus its underlying commodity we present the following table:

Table 7

	Higher average return
British Petroleum vs. Oil price	Oil price
Corn Products International vs. Corn price	Corn Products International
ArcelorMittal vs. Steel price	Steel price
Barrick Gold vs. Gold price	Gold price

Regarding ArcelorMittal versus steel price, this comparison is made from the introduction of steel into the commodity market. This is because the assessment of greater average return for both the company and the underlying commodity must be during the same time period, and from February 2008, the steel price has had a higher average return than ArcelorMittal.

As we can see in Table 6, most commodities have higher returns than the companies in the industry. Since Corn Product International is not vertically integrated, does not hedge against

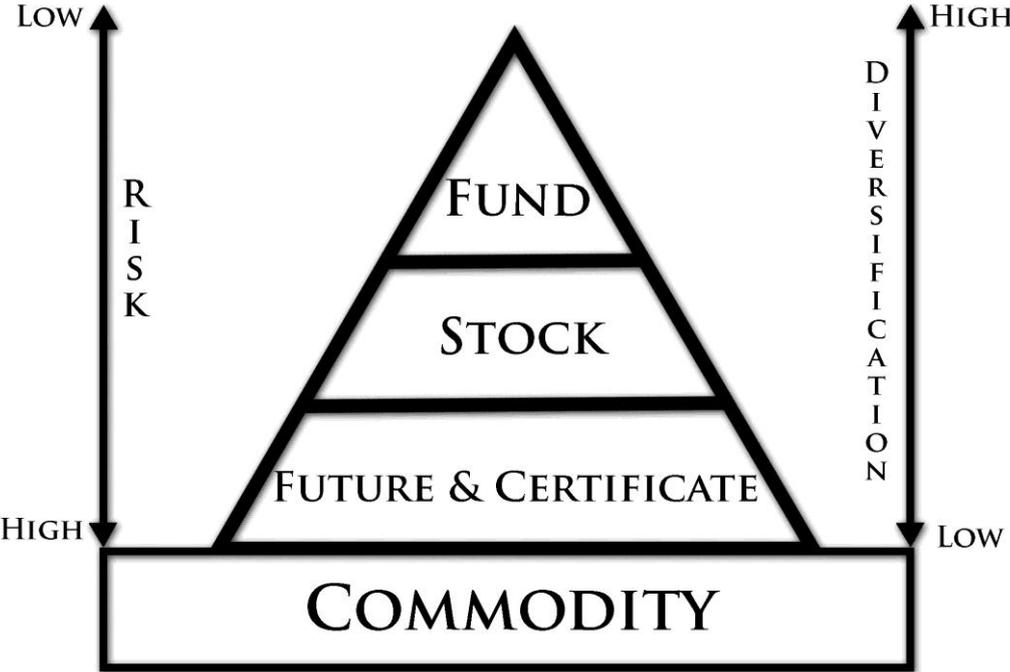
commodity prices and therefore have a lower correlation, it is difficult to know why they have a higher return than the corn price. Diversification may be what has the highest effect of higher returns, but for companies such as ArcelorMittal and Barrick Gold who have a high correlation, they probably will not have a greater return than its underlying commodity due to corporate inefficiencies, even though diversification could result in higher returns than if they did not diversify.

7.3 Commodity alternative investment pyramid and risk

To be able to show the relationship between different commodity investments with risk and diversification, we have created the following model:

Figure 24

COMMODITY ALTERNATIVE INVESTMENT PYRAMID



Source: Own

The Commodity Alternative Investment Pyramid (Figure 24) presents three investment opportunities and their closeness to the underlying commodity, which is represented by the base of the model. The model also shows the relation between the alternatives and the factor

of risk and diversification, where the top of the pyramid is highly diversified, and the bottom more pure as well as closer to the real commodity. The risk has an opposite relationship to diversification and decreases as the diversification rises, which is shown to the left of the pyramid where risk increases with the closeness to the underlying commodity.

The reasoning behind the CAIP comes from our volatility observations. The volatility for each type of investment is as follows:

Table 8

	Commodities				Companies			
	Oil	Corn	Steel	Gold	BP	CPI	Arc. M.	Barr. G.
Annual σ	0,40	0,30	0,48	0,19	0,30	0,37	0,40	0,42

In Table 8, we can notice that ArcelorMittal has a lower standard deviation than the steel as a commodity. This is due to the company’s strategy to diversify their products to meet market demands. No conclusions can be drawn from the relationship between CPI and the corn price because the high level of volatility for CPI does not necessarily mean anything for it does not follow the correlation criteria. Even though BP does not follow the criteria of low diversification, it may still be noticed their diversification into a new product line has resulted in a lower standard deviation than the commodity of oil. This follows the theories surrounding diversification presented in the theoretical framework. Further up the CAIP model, funds should have the lowest volatility since it is even more diversified than company stocks, and in so doing lowers the diversifiable risk. The only contradiction to the CAIP model is the fact that gold as a commodity has the lowest standard deviation of all types of commodity investments. Why does this happen? Since the gold has been a classic solid investment in both times of economic prosperity as well as under financial crisis, the price has not had any drastic fluctuations. Banks has their reserves in gold, not in corn or barrels of oil, which makes it a more stable investment due to the constant demand and reliance. An important aspect of the CAIP is that for stocks to be included, they must follow the correlation criteria.

8. Conclusion

In our analysis, we can observe that there is an effect on both the correlation between share price and the company's underlying commodity price as well as the volatility of the two kinds of investments. Since the returns of the companies' share price are lower than that of its underlying commodity, we cannot draw any conclusions if diversification and vertical integration has an effect on this matter.

Vertical integration, along with the non-hedging policy, has an effect on the correlation between the company's share and its underlying commodity. Diversification, on the other hand, has an effect on both the correlation and the volatility of the company shares. Returns may be affected by diversification, but due to corporate inefficiencies, the company returns are lower than the returns of their underlying commodities.

The criteria for a higher correlation between major companies' share price and its underlying commodity is important for investment analysis, where the right kind of company must be chosen if using company shares instead of its underlying commodity in a portfolio. If the analyst does not choose to use these criteria, these shares may follow the market during a recession instead of the underlying commodity price, leading to lower portfolio returns. In the question regarding returns and volatility, diversification plays an important role when choosing to use the company shares or commodity certificates. Diversification lowers the shares volatility, except in the gold industry, which depending on what the investor is seeking for his portfolio can outweigh the high returns of the commodity prices.

9. Suggestions for further research

We suggest the following alternatives for further research:

- When knowing the three criteria for a high correlation, we would think that further research surrounding the validity of this subject would be interesting.
- It would be of great interest to see the results of dealing with companies all following these three criteria. What would their findings be?
- An investigation of the reliability of the CAIP model with different selection of shares, funds and commodities would be interesting.

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11. Appendix

11.1 Interview with Barrick Gold

Interview with Susan Muir, Senior Director of Investor Relations at Barrick Gold, by e-mail

Date: 2010-10-29, 4:48 a.m. Swedish time

How do the prices of “your raw material” affect your company’s Gross margin, and further the company’s Stock price?

The price of gold has a direct bearing on our margins. Along with net income and operating cash flow, we use cash margins, which is our realized gold price minus total cash costs, as a yardstick to illustrate profitability, and these have been steadily increasing over the past few years as gold prices have risen and we have kept our cash costs flat or in the case of 2010, lower vs 2009. There is no direct correlation between margins and share price, but as we have been able to contain or decrease cash costs, grow our margins and deliver earnings that have beaten consensus for the past six quarters in a row, our share has begun to outperform all of our peers.

What actions are taken to hedge the risks of change in commodity prices? Continuous/active actions and temporary actions under crisis.

While we don't hedge gold, we do actively manage our input costs such as diesel and propane by hedging them, and also hedge copper and the Australian dollar (which represents about 30% of our operating expenses) to give more predictability and less volatility to our earnings. This is a well managed and long standing, continuous program, proactive rather than reactive.

What other risks does the company face?

Like any other gold company we face a variety of risks such as operating risk (technical, weather etc), geopolitical risk (although Barrick less so as over 60% of our mines are in investment grade countries), permitting risk (obtaining the necessary permits to begin construction) and social risk (increasingly part of the permitting and operating process). However due to our size and scale, our comprehensive risk management and corporate social responsibility programs, Barrick has an excellent track record of meeting our operating

guidance (annual production and cash cost estimates) and of building new projects on time and budget.

How important is diversification to the company?

We are a gold focused company and the majority of our revenue is from gold. That said, our preference is for long life mega-assets like the 2 we are building currently and the other projects in our pipeline which will afford us the ability to get off the treadmill of having to constantly replace production and which allows us to be disciplined and patient with respect to acquisitions. However these long life assets increasingly are polymetallic in nature (i.e. gold-copper porphyries) hence it is possible that we will end up with some increased copper content, but we are not actively looking for base metal assets.

11.2 Interview with British Petroleum

Interview with Brian Sullivan, Manager of Investors Relations, North America, by phone

Date: 2010-12-02, 2:00 p.m. US central time

What kind of oil is it that BP manufactures, is it Brent crude oil, crude oil or sour crude oil?

We produce about 400 million barrels of oil equivalent per day. Of that, 60 percent of it is liquid, or oil, and the remaining 40 percent is natural gas. When we use a conversion of that, for every 580 cubic feet of gas we assume that is the energy equivalent of a barrel of oil, so we make that conversion. Of the oil that we produce, it runs the full gambit 'cause we produce most all major ... globally. In general we price our crude oil off of either Brent or West Texas Intermediate which are light sour crudes. Most crudes, or the most valuable ones, are sweet, in other words, they have a light or small sulfur content but I'd say our oil is of average quality.

The reason why I asked is because I was wondering what kind of oil prices I should research.

Well I mean, if you're going to do a statistical correlation the most commonly sided is West Texas Intermediate. The reason why that's the case of most people, that's the benchmark grade of crude for the futures contract that's traded on the Chicago Mercantile Exchange, that is the reference crude for that instrument.

I don't know if you got some time to look at the questions, the first question is "how do the prices of oil affect your company's Gross margin, and further the company's Stock price?"

There is a bit of an inconsistency here, and let me explain. Obviously we are highly leveraged to commodity prices, both oil and gas, as they rise, our margin business ... for the most part tend to go to our bottom line and so our reported results and our cash flows increase proportionately to changes in those prices. Now, if you try to make a leap in logic to stock price, the question is a little different. It's not price of oil today, it's the markets conviction of future prices and so they tend to diverge at that point 'cause the futures contract is a different trajectory, it might be called contango, I don't know if that term is familiar to you, which means arising future price or might be in backwardation, which would mean a declining future's price. And so everybody has got a different view on what the future holds and it's for that reason that the market tends to discount future prices, in other words it's pretty typical for the market to impound high prices cause they don't believe we are going to last. The market sentiment is that this is a cyclical business, there will be ups and downs and prices will average, you know, call it 60 dollars a barrel, which pretty much is what the market is discounting right now, somewhere in the 60 dollar ranks. Even though crudes are trading in the midst upper 80's nobody's evaluation reflects that.

But do the dividends at the end of the year reflect the difference of net income?

No, the capacity to pay a dividend is affected but for most companies the dividend is not affected in the short run. Let me explain, most typical dividend policies are that you set the level of dividend you feel is affordable and you hold it there until you see a world that has changed structurally that will allow you to increase the dividend without having to later resend it, or reduce it. It's the most common dividend policy. There are companies who have a variable dividend policy but they're I think unusual, and there are other companies that have a formulaic dividend posture in which they say, well whatever net income is we are going to dividend out 40 percent of it. Our position is we want to offer what we consider to be a sustainable dividend and one that is progressive. By that we mean a dividend which grows in proportion to the growth of the firm. Short term changes in commodity price don't affect our dividend policy. Longer term changes in prices certainly would. We are on the record of saying, and we collectively refer to this in our financial framework, as long as oil and it's range amount in the 60 dollar range, then we have created a fiscal, a spending in a cash generation posture which is sustainable. Unless we've moved outside of that range we

wouldn't be changing our posture of payment of dividend. Now go down to where we have suspended the dividend as a result of the Gulf of Mexico incident and we will be revisiting the decision to possibly reinstate the dividend next February when we announce the fourth quarter results. And, you didn't ask this but you know obviously the uncertainties of the cash outflows from that liability necessitated that we take a pretty conservative posture for cash and then it's of a consequence of that uncertainty that we have had to suspend the dividend.

Your next question is actions taken to hedge commodity price changes, and we don't. Actually we think that people want to own BP because they seek exposure to commodity price changes. Now there are other companies whose business model is different from ours. Our model is such that, because we are integrated we've got kind of a natural hedge against price changes ... (9:41) the hydrocarbon value chain. So said another way, when prices rise, our upstream business, and by upstream I mean the pieces of our business that produces oil and gas, it does very well, but conversely the downstream part of our business, which is the one where we refine crude oil into gasoline or jet-fuel, those businesses tend to suffer, their margins tend to compress. The decisions we've made about the segments of the value chain we want to participate in, those have the effect of creating a natural hedge. But in the sense I think you meant it, in terms of using futures contracts, selling forward products, we don't do that. The smaller exploration production companies, it's very common for them to do that but they do that because they need to lock in the cash flows in order to sustain their drilling programs. And we are of sufficient scale and diversity we don't have to do that. We'll just spend right through it because we have a huge capacity in our balance sheet to borrow and they don't. So our strategy is revenant speed up slow down which is what they do 'cause they are driven by cash. We invest by cycle, thereby capturing efficiencies that they're unable to because they spend more when prices are high, and of course when prices are higher their costs are higher too. So our strategy is the opposite, we want to be spending when prices and costs are lower and we'll capture the upside on the backend of the cycle when prices rise and we got production turned on, a different way of investing through cycles. No we don't hedge in the way you meant. We do however hedge of foreign exchange risks. We are a dollar denominated company, crude oil is priced in dollars, but much of our costs are in other currencies. The other thing we hedge is interest rate exposure, we tend to swop that out. But other than that, no, we don't do hedging. So let's see what your next question here is, continuous and active actions and temporary actions under crisis. You're going to have to help me with that one.

It's kind of linked to the question that you just answered, if there are any changes to the strategy when one undergoes the actions during the year or under a crisis just like, let's say, the financial crisis in 2008.

We have a performance management process that is pretty typical of any company that obviously you have a business plan and then you measure performance against certain objectives and metrics, and you forecast your performance forward against those plans, and as the environment changes and as your performance deviates we have a process where we ask ourselves how are we doing relative to where we want to be, and then if we are not where we want to be, what interventions should we take in order to correct the anomaly. That might mean slow down some projects, might mean spend more money in some places, it might mean that we have to change the number of rigs we operate and run. So there is a feedback loop, collectively we refer to it as a performance management process that allows us to monitor that and it's through those discussions with management that they then make tactical changes to the business plan to respond to market conditions. It's essentially the same process for a crisis only that it happens more rapidly obviously.

But there are no hedging of these risks during the crisis? For example, right under a crisis you might know that the oil price will go down, do you buy a future then or something similar

We have a part of our business where we exercise that discretion. I answered your question at the first level; let's go to the second level. The general rule, we don't hedge oil and gas prices. But we actually, since we are moving oil all around the planet, because this oil isn't where we necessarily want to refine it, and so there is an imbalance, and we trade oil across the globe, so I would ... that we can optimize both what we receive for oil as well as what we pay for oil that we want to refine. We have a whole group of people whose job it is to manage the logistics of trading crude oil around the globe. And because they are in the fiscal market they have the opportunity to collect reconnaissance that enables them, through our global oil trading businesses, we can take financial position on our direction of business that does just that, that trades on that information. And we can do the same thing for natural gas, and we trade power and I think that's it. Well we trade NGLs and other things to, but for the most part it's oil and gas and power. But that is a relatively small part of our business.

The next question was kind of what you were talking about, when you hedge the risks of other types of resources and as well as currency and things like that. Are there any other examples of hedging from other risks?

Well there is a whole list of risks but most of them you cannot hedge against. I think if you are talking about hedge-able risks, maybe the only one is insurance, where we've decided that it makes more economic sense to us to self-insure, as opposed to purchase insurance. There are a few exceptions we're required to hold insurance by law, like for example workman's compensation, if you hurt somebody on the job, that sort of insurance is compulsory. But for example in the Gulf of Mexico we did not insure for the oil spill there, that's all self insured and in our experience that's all part of the value of our business model since we do business in such a scale, we can absorb that risk without paying someone else to take it from us, since the economics there don't work to ask someone else to take that risk from you, they would ask too high a price. It's not about the company proposition; we can afford that exposure, whereas other companies of a smaller scale could not. For that reason, that's risks that we elect to retain because it's not efficient to lay it off to someone else. The other risk that we have, they are more strategic, like for us the big risk is, what if some country nationalizes our assets or expropriates them, worse case, and do about that, that's just a strategic risk. Whether or not we are successful exploring for oil and gas, can't do anything about that, can't hedge it. The other big risk buckets are more operational like does our plan work, does it run in time, does it produce quality products, pipeline integrity, things like that, and you can't mitigate those risks through financial mechanisms, it's all performance based.

The next question is how important is diversification to the company, and actually I think it's very important. Let me explain, I see diversification in several different dimensions. When most people think about diversification, your context is probably in terms of the returns to the company. You want diversification to minimize volatility of returns, to presume that's probably where you are coming from, and again since people look to expose themselves to the volatility of crude prices, as discussed we don't hedge, there's an example where diversification is not helpful to us in terms of commodity prices, but we do diversify in terms of the value chain. We talked about that we're an integrated all company, integrated means that we participate along the full spectrum of the value chain, so we explore, we produce, we transport and we manufacture finished products, and we deliver them to the customers all the way down to the burner tip or the engine. And as we discussed, during the business cycle, or the commodity price cycle, we do experience diversification through that integration of

participating in enjoying highs as oil prices rise and the upstream part of our business, while the downstream part of our business suffers because of increased car (21:04). There is diversification there and I think it is important for people who want to invest in an integrated all company. If you studied the concept of beta in financial, is that a term that's familiar to you? (Yes) It's your variance to the market; we have a relatively low beta as opposed to pure play companies in the E&P sector, companies that just explore and produce have a much higher beta than we do. In some instances, portfolio managers they use the term "if you are seeking alpha", or you want return more proximal to the market return, we are more attractive since we are a lower beta company. The other element of education (22:06) which is very important to us is we participate both in oil and gas, and right now those are in two complete markets, the oil market and gas market are completely different. Oil is pretty much a global market and natural gas is not, it's a regional market. And it's great in our instances to have diversification geographically as well as diversification between oil and natural gas. At any given time, one is doing better than the other and rarely do they all do well at the same time. The diversification between oil and natural gas is quite beneficial I think. And then finally geographic diversification is helpful to us more from an operating standpoint. We have a lot of production off-shore and off course if you had all of your production in a hurricane or a cyclonically prone area that would be dangerous. It's good that since it's all across the globe, if something bad were to happen it wouldn't take a big piece of your company. So that diversification from an operations perspective I think it's very valuable to us.

We were also looking at the annual reports and we noticed that BP makes a lot of investments in other energy sources. Is this also a future possibility to get a broader product line for further diversification?

Yes, I agree with what you said. There are a couple of ways to look at it. They are large relative to everyone else they are not large relative to our total investments. Well we invest about 20 billion dollars a year. In any given year I think the most we have spent on alternative energy investments is 1.5 billion, but it's still much larger than most people are spending. So we do see a future in those, and I think you are on to something there. There is an element of hedging going on there because quite honestly we have a lot of legacy, you know, carbon intensive assets that what we would like to do is create what we call energy pathways such that we can continue to monetize those assets rather than having technological disturbance having suddenly render them less valuable. So we can kind of steer the transition through, in such a way where our assets can be of value. As an example of that, bio-fuels, bio-fuels as a

manufacturing business is just like refining, it just starts with a different input. Well we're good at running refineries, we got all the legacy pipelines and distributions and terminal systems in place, so it would be natural for us to want to participate in bio-fuel business in order to maximize the value to our legacy assets.

11.3 Interview with ArcelorMittal

Interview with Hetal Patel, General Manager of Corporate Finance & Investor Relations for Europe, by phone

Date: 2010-12-06, 10:30 a.m. Greenwich mean time

We were wondering how the price of steel affects the company's gross margin, and the stock prices as well as the dividends.

Let's break it down into different questions, they are not really interrelated. I think the price of steel, first of all, is an international price. Steel price is now driven mainly, I'd say, the reference price is the Chinese price. What happens, China is now 50% of the world's steel consumption. Emerging markets in total is about 80%, so really China has been such a dominant driver for the steel price and steel demand globally. So the reference price in China is then taken in developed markets and emerging markets, so Europe and USA are the two main second markets beyond China. So they are referenced off that price. So we aren't actually in China, we have small participations but we are not a fully subsidiary in China. However, we still use China as our reference. So in terms of gross margins, what you have to look at is obviously, it's a margin business. So, whatever our costs are we have to cover our costs and charge a premium on the costs for the steel price. Now it depends on different grades of steel. You get different grades totally from the ox standard; I would say billets and bars, which are towards the long product range which are lower. These products are used for the construction markets, just, you know, buildings, residential markets and then they move up the value chain to become hot galvanized, coated, zinc coated products, and then you get to the high-end specification products. So at the higher end you get a higher margin. Obviously there is less demand for those 'cause they are more speciality steels. But however throughout the whole value chain, that you do get margins based on different demand cycles of steel. So in terms of gross margin, how does the price of steel affect Arcelor's gross margin, fundamentally it's two things; we have to cover our costs. The main cost input in steel is iron

or raw material costs in coal. Currently those prices are very high 'cause there has been a new change in the way that raw material in the steel industry is governed. Previously there was an annual contract, now it's a quarterly benchmark price and as that price is higher steel companies have to charge higher prices to offset the higher costs. Ultimately, when you cannot charge a higher price than your costs, you become loss making. Now, contra to previous crisis's and economic downturns, steel companies will produce irrespective of the price that we are charging. And there the idea was, it was a volume over price strategy, that they would make money by more steel and a lower price even if it was loss making, below the costs. That's now changed, the last ten years the steel industry has gone through a number of consolidations and by doing so it has become more disciplined and by doing so currently ArcelorMittal like a number of it's players are only operating at 70% percent capacity. It's a deliberate ploy of us to not operate fully 100% because there is no demand for 100% steel. By producing 70% steel, 70% of our production, we are reducing our fixed costs and bolstering our margins, thereby reducing our cost base. And at the same time keeping the tightness in the market that whatever we are producing, there is a supply line for our steel. That way we are actually also going to maintain price strategy, so our strategy is now a price strategy over volume strategy.

Indirectly this has an impact on our stock price because then we are able to maintain cash flow generation, we are able to maintain profitability, and that way investors can see that this company is operating rationally, it's not disrupting the market and it should hold it's stock price or it's valuation. Stock price, you should also remember, it's really a derivative of future value of the company. So other efforts that ArcelorMittal are doing is we are looking at driving costs out of the company, we are becoming more leaner, more rational reducing our head count and we are going through a stringent SGNA program reducing costs wherever we can and we have a management gains plan in place whereby we are looking to shave off five billions of costs over five years. Currently we manage three billion, our cost reduction, we still have a further two billion of cost reduction. Again, these are positives for our investors, they see that the company are making efforts to reduce its cost base, maintain its profitability, going forward in the future.

The other part of the question was about the company's dividends.

Dividends is really, you know, de facto the ability of a company to first of all generate cash flow. Its got to be profitable to aid, further its growth, it's got to be able to furnish its asset

base like pay for its own maintenance capex, I got to be like ArcelorMittal has growth opportunities as well, we are now looking to expand our operations in India, Brazil and in our mining business which is critical to us. After that, we want to maintain our debt level and then even after that we have a dividend policy in place where we agree to pay 75 cents per share to our investors. So that is what our policy is first of all you have to maintain your asset base, you have to maintain your growth opportunities, you have to pay for any acquisitions you make and you have to be pre-cash flow generative, from you own existing operations make sure you are making cash, and then we pay out dividends. So, it's really a factor of those things first before we start paying out dividends, which we are currently doing and still continue to believe we can do so going forward.

Are there any actions taken to actually hedge the risk from changes in prices? Eg. buying futures on the commodities.

At the moment we believe that the commodity hedging market is still in its infancy, we don't condone it, we believe in the normal, still cycle, buying and selling of iron ore and steel on the swap market. I think, at the moment there is not enough liquidity in these exchanges that are selling steel as a commodity. Once you are doing that, you increase the volatility in steel pricing. So we are not actually doing anything yet in that respect.

Are there any temporary actions undertaken under crisis? Eg. hedge against extreme changes in commodity prices?

The actions that we take under crisis, works specifically for fluctuations and changes in price, as I have said before, we cut our production, by cutting production we maintain equilibrium, we maintain the demand supply for steel, thereby, you are already by your actions trying to maintain a higher pricing discipline. Imagine if you produce a 100% when there is only a demand for 50%, that extra 50% you have to sell at a very low price, and then you start making loss making, so those are the main differences, you know, as I said before cutting production is important, looking at your supply line. Importantly as well, you have to start to improve your service quality in a crisis to customers. You know, focus on your customers, focus on your costs, focus on your competitiveness, the three C's as we call it.

Are there any other risks that the company faces, and if there are any risks, how are these hedged?

The thing I think you are going to get are exchange rate risk. We do hedge against these by having our debts in different currencies; we operate in 20 different countries, so Brazilian real, South African rand, Ukrainian hryvna, euro, US-dollar. We have different currencies, so we have different hedges in place to offset these currencies and to maintain our balance there. Other risks, you know, we try to become backwardly integrated in iron ore so that we can protect ourselves from rising raw material costs. That is a risk, an action we are taking to increase our self-sufficiency.

How important is diversification to ArcelorMittal?

In what respect is it? Product or geographical?

All kind of diversification.

The main one is product diversification. So we in all types of products, stainless steel, high-end steel, low-end steel, so our risk profile over the cycle is reduced because in different times of the year, or different cycles or different geographies these particular products are more attractive. So by being product diverse we can smooth our risk profile over the year, likewise geographically basically in different countries we are exposed to different environments and different times, likewise the US has been in recession before Europe, we still benefit in Europe, and likewise the emerging markets, for the moment in Brazil, we can benefit from it, and even South Africa we are domestic leader in that market, we can benefit from having our leadership position in South Africa. So I think diversification is very important to the group, as a truly global steel player we are able to then source the best materials from the best locations, and we can grow quicker as well because then we are in different locations.

Are there any plans to increase the number of products in the future or spread to new geographical locations?

Well, I think in the future, we obviously would like to be more involved in China because of the size of the market there. I think India we have already laid down plans for some big potential sites. I think certainly that's going to continue, you know, India's market is going to grow three times in the next ten years. So these, are the emerging markets, the BRIC-countries, Brazil, Russia to some extent, India and China, are the areas you have to query and diversify into.

And the products? Are there any plans to extend?

Well, the products I think we are going to focus on carbon steel, stainless steel we will look to spin off, so in carbon steel there is no one particular product that overrides any other one. We look at all types of products, we have a huge R&D-facility that looks to make steels lighter, faster and more resilient for the auto industry, that's important for the group. But generally speaking we service all types of products and qualities.