Speculative influence on copper prices
# Table of Contents

Table of Contents ........................................................................................................... 2  
Motivation ......................................................................................................................... 4  
1. Introduction and Problem Definition ........................................................................ 4  
2. Commodities Markets ................................................................................................. 8  
   2.1 Overview of the Commodity Markets .................................................................. 8  
   2.2 Primary market (Spot or Cash market) ................................................................. 10  
   2.3 Futures market (Secondary Market) .................................................................... 11  
      2.3.1 Listed (Exchange-traded) Derivatives ......................................................... 13  
      2.3.2 Over-the-counter (OTC) Derivatives ......................................................... 14  
      2.3.3 Potential advantages of trading Futures vs. Spot ....................................... 15  
3. Definition of Market Actors ....................................................................................... 15  
   3.1. Hedgers .................................................................................................................. 15  
   3.2 Speculators ............................................................................................................. 17  
   3.3 Arbitrageurs .......................................................................................................... 18  
   3.4 Investors ................................................................................................................ 19  
   3.5 Index Providers ...................................................................................................... 20  
4. Financialization and de-regulation of commodities markets ..................................... 20  
5. Bubble Trouble (Speculative Bubbles in History) .................................................... 23  
   5.1 Definition of Financial Bubbles ......................................................................... 24  
   5.2 Five Steps of a Bubble (“Here comes the boom!”) .............................................. 27  
      5.2.1 Displacement ................................................................................................. 27  
      5.2.2 Boom ............................................................................................................. 28  
      5.2.3 Euphoria ........................................................................................................ 28  
      5.2.4 Profit Taking or Crisis .................................................................................. 29  
      5.2.5 Panic or Revulsion ......................................................................................... 29  
   5.3 Bubbles in History ............................................................................................... 30  
      5.3.1 Dot-Com Bubble (1995-2001) .................................................................... 30  
      5.3.2 US Housing Bubble (2007-2009) ................................................................. 31  
   5.4 Explanation of Bubbles ......................................................................................... 35  
6. Pricing Fundamentals ................................................................................................. 40  
   6.1. Relationship between Spots and Futures ............................................................ 40
6.2 Basis .................................................................................................................................................. 40
6.3 Types of Market: Contango and Backwardation .............................................................................. 41
6.4 Convenience Yield ............................................................................................................................... 42
6.5 Delivery Mechanisms ............................................................................................................................ 42
6.6 Commodity as an investment ............................................................................................................... 43
7. Copper Price Influencing Factors ........................................................................................................... 44
   7.1 Demand ............................................................................................................................................ 44
   7.2 Supply ............................................................................................................................................. 48
   7.3 Dual Demand ................................................................................................................................. 52
   7.4 Economic Trends and World Trade (Doctor Copper) ...................................................................... 53
   7.5 Metal Inventories and Stockpiles .................................................................................................... 55
   7.6 Uncertainties About National Economic Policies .......................................................................... 56
   7.7 U.S. Presidential Elections .......................................................................................................... 58
   7.8 New Technologies in Mining Production ...................................................................................... 60
   7.9 Substitute Goods ............................................................................................................................ 60
   7.10 Stock Market Effect ...................................................................................................................... 61
   7.11 Foreign Exchange and Interest Rate Effects .............................................................................. 61
   7.12 Stop-loss Strategies ...................................................................................................................... 64
   7.13 Transactional Fees ........................................................................................................................ 65
   7.14 Google Trends ............................................................................................................................. 67
   7.15 Trend Following ............................................................................................................................. 68
   7.16 Other External Factors ................................................................................................................ 70
   7.17 Conclusion of Factors Affecting Copper Prices ........................................................................... 72
8. Summary of findings and conclusion .................................................................................................... 73
9. References ............................................................................................................................................. 74
Motivation

Studying Masters in Finance at Corvinus University of Budapest has reiterated to me the importance of accurate pricing of commodities on international levels. I have had the chance to put the knowledge I gained during the lectures into practice, when I started to work for one of the investment banking giants, supporting a business unit within the Fixed Income division that bankers refer to as “FICC”, for “fixed income, currencies and commodities”. I have been lucky enough to work relatively closely with London-based commodity traders, who gave me a heads-up on base metal pricing fundamentals and the structure of the futures market. When they showed me some real-life examples, I was taken aback by the fact that big sell orders can move the market lower in less than a minute, without actual demand or supply-side support. Price fluctuations of hundreds of dollars/ton every day is certainly not beneficial neither for costumers and nor for suppliers, and attributing these sudden price movements to solely demand or supply would be a misinterpretation of what actually happened.

I am therefore motivated to study this topic through personal experience, and in my thesis, I wish to discover which other factors could be setting copper prices on top of fundamentals.

1. Introduction and Problem Definition

My study was undertaken to analyse the impact of non-supply and demand induced factors on commodity, more specifically, copper market prices.

Commodities are a class of basic goods or raw materials that human use to create a liveable word, for example, energy to heat, metals to build transport equipment and agricultural products to feed themselves. Commodities are said to be the "real deal" since they are the real products that make everyday transactions and economies turn, and also the most visible materialization of purchasing power and living standards through the prices we pay for them (Barry Norman, Investor Trading Academy, 2015). It is, therefore, vital that these prices reflect the reality of supply and demand accurately, that they are predictable and kept affordable in the long run. In order to provide accurate costing for constructions, infrastructural investments or other projects, producers, suppliers, processors and other interested parties require price predictability of their basic materials.
If the price of raw materials -let's say base metals- jumps suddenly, it becomes much more expensive to complete the project in question and consequently may result in delays or cancellation (Vestas, 2006). What is more, looking at the macro levels, revenues obtained from raw material exports are an important source of income for the developing countries, that is, commodity price fluctuations or instability can have a serious negative impact on their economic growth and income distribution, increasing poverty (Overseas Development Institute - ODI, 2003). Bottom line, the assumption is that commodities are trend well and trend all the time because they are impacted by the environmental forces around the world.

This assumption has held up pretty well as long as prices were driven solely by changes in global demand and supply. “Traditionally the purpose of commodity markets, unlike stock markets, was not to attract investors but to enable producers and users of physical commodities to arrive at a reasonable price for their goods and hedge their price risk over time” (U.S. Senate Committee, Washington, DC, 2011). Buyers and sellers only transacted on the primary market, where commodities were bought and sold for cash and delivered immediately. It is a basic economic principle stating that when there is an oversupply of a good or service, prices fall and vice versa.

Nonetheless, in the not so recent years -as a matter of fact, we could even go back until the 17th century, to the Dutch Golden Age- we have seen several repeats of price hikes, and incredible price fluctuations, which came us and the greatest economists to realize the bitter truth, that commodity market prices are notoriously volatile.

Before even guessing what factors could possibly cause these unusual ups and downs in market prices, I need to bring secondary, also known as futures markets into the picture. In essence, -unless of course you are a commercial market actor, wanting to lock in a price to buy or sell a raw material in the future- you probably do not want to find 500 tons of grade A copper in your doorstep, so instead of having the actual commodity, you will rather buy futures contracts for speculative purposes. Speculators, seeking only to profit from price changes, can cause serious distortions in prices (USSPI, 2011). Some speculation may be seen as essential since it provides liquidity, but "hundreds of billions of dollars of bets placed on expectations" kind of speculation, or excessive speculation certainly isn't. By initiating massive positions in a bull market, large speculators have the ability to drive the price of the futures contracts even higher, and similarly, when they
remove their positions or go short, they can push the market lower (Doug Casey, 2013). Massive sell orders like that can cause prices to plummet for a long period of time. What is more, the structure of the futures market itself can force prices to fall more than would be indicated by supply and demand fundamentals. For example, many investment banks that deal in metals employ stop-loss strategies or break points and as result, certain prices could see demand for metal changing greatly for a small change in price. In February 2015, copper prices jumped by over $100 during official trading on the London Metal Exchange (LME) due to the fact that stops were triggered after the red metal broke through its resistance level, a price level that market participants are unwilling to surpass thus they sell automatically (Metal Bulletin, American Metal Market, 2015).

Copper was known as one of the worst performing commodities of the past two years thanks to China’s slowing economic growth, until the end of 2016, when the red metal experienced a large upward movement in its market price, and companies with operating copper mines also experienced bumps in their stock prices.

1. Copper 1-Year Spot prices

![Copper 1-Year Spot prices](source:Nasdaq (2016))

The sudden price hike can partially be explained by supply-side factors, such as outages at the world's top mines, including Freeport and BHP Billiton's huge Escondida mine in Chile -responsible for as much as 5% of the global output- or export bans coming from local governments for example in Indonesia. Goldman Sachs believes that the general view is that supply is decreasing and demand is increasing, thus finds copper firmly in a bull market territory and forecasted long-term price recovery (Danielle Bochove, Bloomberg, 2016). Why I am not confident what we are experiencing here is entirely supply and demand driven is because of the fact that strikes and bans have always taken
place in history without having a serious impact on market prices. Raw material extractive countries are usually developing countries so there is a known trade-off between cheap labor cost and significant political risk. In addition, the above mentioned, forced shutdowns only chipped away the mine supply that expected to be in a small surplus this year. Further prove my point, based on China’s Jan-17 trade data, the total copper imports were actually down 22% from December to 380,000 tons in January, since trading was dampened by the week-long Lunar New Year holiday (Er-Bakır, Monthly Copper Bulletin, 2017). Not a rocket science to see that this just doesn't add up… If supply slightly increases, which I believe the current situation is, market and stock prices should go down. So why is copper's price up? I suspect speculators are at play here and it is more about investors thinking that Trump's potentially going to be consistent in making good on his campaign promises and spend a lot on infrastructure (even it remains to be seen whether these expectations are borne out by reality or not).

During the period of financialization, from 1980 until 2010 the constituency of commodity markets has changed notably and became dominated by speculators instead of commercial actors. Since 2005, trading of commodity futures and options has risen faster than any other sector of the global listed derivatives markets. Between 2006 and 2015 the number of non-precious metal contracts traded increased by 1200%. This incredible growth of volume in commodities trading meant that speculators would need to take larger positions to manipulate the market and they could do so, since U.S. Commodity Futures Trading Commission (CFTC) had several measures attempting to raise speculative position limits to meaningless levels, creating legislative loopholes in the system. Regulators like CFTC or National Futures Association (NFA) often missed the basic differences between commodity and equity markets, such as physical production and required storage. After the dot-com crash of 2000, investment in commodities became one part of a larger investor portfolio allocation as a risk hedge. This resulted in a significant increase in commodity assets, from less than $10 billion around the end of the last century to a record high of $450 billion in April 2011 (Institute of International Finance, 2011). Consequently, the volumes of exchange-traded derivatives on commodity markets are now around 30 times greater than physical production (Silvennoinen and Thorp, 2010).

**All in all, my research question is based on the fact that prices are influenced by many other factors than just supply and demand, and in consequence, the horizon**
for commodity market prices remains unpredictable. In my Master's thesis, I will investigate both on the primary and secondary markets to what extent, and in which ways, does speculation influence the market price of copper within a one-year period, from 2016 March to 2017 March.

In the context of my dissertation, I deliberately restricted the scope of my study to (grade A) copper traded on the London Metal Exchange. The reason for this is because among the many commodity classes, base metal prices seem to be the most straightforward and I would like this thesis to be as comprehensive as it can be. In the case of natural gas, for example, there is numerous price affecting factors in the background – such as seasonality, capacity constraints in various pipelines and political interest- I am not fully familiar with, and therefore I would not be able to explore them explicitly. Moreover, the argument is that copper, known as "Dr. Copper", is the most used metal for industrial purposes, so the price of copper is a proxy for the strength of the economy (Charlotta Mellande, 2015).

2. Commodities Markets

2.1 Overview of the Commodity Markets

“Everyone thinks that they know what a commodity is until they try to define it” (Morgan Stanley, Commodities). Along with stocks, bonds, real estate, and other assets, commodities form one of the major asset classes. Commodities matter, because we see them all around us. Being a class of basic goods, they help fulfill the most fundamental human needs, such as drinking a coffee or driving a vehicle. They are sometimes raw materials, to be more precise, usually inputs to the creation of other goods (Olivier de Schutter, 2009). In most of the cases, commodities are physical assets but not always: less tangible commodities include electricity and carbon emissions. For the majority of the world’s population, the most visible incarnation of economics is through the prices they pay for basic commodities such as wheat or rice. It is, therefore, vital that these prices accurately reflect the reality of supply and demand, that the prices are largely predictable and that they are kept affordable (FAO, 2011). Commodity prices have crucial implications, in particular for developing countries that are often dependent on the import of basic commodities such as food and fuel (Cornelia Staritz/Bernhard Tröster, 2015). Hence, commodity prices have direct effects on food and energy security, socio-
economic development and poverty. Many developing countries are also dependent on the production and export of few commodities, and normally these countries benefit from rising revenues when commodity prices are high. Chile, for example, the world's top copper producer not surprisingly relies heavily on the red metal. But they are also affected by increased price volatility, which leads to major difficulties in managing their economies (UNCTAD\textsuperscript{1} 2012). What is more, a number of interested parties: producers, suppliers, and processors, as well as end users of commodities, all require price predictability of their basic materials in order to provide accurate costings for construction or other projects (Vestas 2006). For example, the construction of one wind turbine uses hundreds of tons of steel and around a half a ton of copper. If the prices of these commodities rise suddenly, it becomes much more expensive to complete the project and may, therefore, result in delay or cancellation.

Trading commodities are generally broken down into several types that include oil and energy products (such as crude oil, heating oil, natural gas and gasoline), precious metals (gold and silver), base metals known as the “hard commodities” (copper, aluminum, zinc, lead), agricultural commodities called “soft commodities” (including corn, rice, cocoa, and sugar) and commodity indices (DJCI - Dow Jones commodity index). Each of them has slightly different characteristics, markets, in terms of where they traded and obviously slightly different users in terms of buyers and sellers.

The term commodity is specifically used for an economic good when the demand for it has no qualitative differentiation across a market. In other words, commodities have substantial fungibility; that is, they are interchangeable and the market treats them as equivalent with no regard to who produced them (O'Sullivan, 2004). One cannot really tell the difference between one firm’s product and another since they are uniform in quality between companies that produce or sell them. As the saying goes, "From the taste of wheat, it is not possible to tell who produced it, a Russian serf, a French peasant or an English capitalist" (Karl Marx, 1857-61: part I.). Petroleum, crude oil, and electricity could all be considered commodities, while Nike’s shoes would not be, as consumers consider them to be distinct from shoes sold by other firms.

From an investment point of view, commodities are an interesting opportunity, but definitely not a place for beginners. That is because things affect price have a lot of

\textsuperscript{1} United Nations Conference on Trade and Development (UNCTAD).
different components -such as storage and delivery costs- making them volatile and unpredictable.

Every commodity has an active market with buyers and sellers constantly transacting with each other. **Commodities may be traded as normal exchange of goods for cash, known as trade in actuals or derivatives on commodity exchanges, using standardized financial contracts.** That brings in the next thing, the futures contract, which is the right to make or take delivery on the physical commodity. Because of that right, every contract has a so-called expiration date and first notice date. Traders need to ensure that they enter and exit positions prior to the expiration date, otherwise, they will end up having the 1000 tons copper at their doorstep. Standardization of the amount and quality of the commodity is an important feature of commodity futures contracts. In addition to the quantifiable requirements, each contract listed on a commodity exchange demands a specific grade and quality (LME, 2009). Specifications differ for each commodity, but the contract is the same in each market. A contract size is the deliverable quantity of commodities or financial instruments underlying futures and options contracts that are traded on an exchange. For example, every copper futures contract on the LME has a trading lot size of 25 tonnes/metric tons (with a tolerance of +/- 2%), and each $1 move in the price of copper translates into a $100 change in the value of the copper futures contract.

2.2 Primary market (Spot or Cash market)

On the physical market (also known as cash market or spot market), commodities are bought and sold for cash and delivered immediately. Two parties enter into a private agreement to exchange a commodity to cash, delivery almost always occurs. Commodity is expected to be delivered in a month or less (CME - A Trader’s Guide to Futures, 2015).

**With regards to copper’s primary market price,** I investigated whether the copper market is monopolistic or if there exists any monopoly force (mine extracting a significant percentage of the global copper supply) at all. I found that the production is dominated by numerous producers, including Freeport-McMoRan Inc., Glencore International AG, Amerigo Resources Ltd., BHP Billiton Ltd., Codelco, and Bougainville Copper Limited (Transparency Market Research, 2016). According to a research conducted by

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2 However, the majority of investors trade rather derivatives than actual physical.
CRU Market Analyst Group in 2009, the market share of the major players is as per below:

2. Copper production by majors

![Pie chart showing market share by majors](image)

"There have been many attempts to manipulate the copper market through cartels and corners, many of which have strongly influenced short-term prices but had little long-term effect. There are too many potential sources of copper to exercise total control over the world’s primary and secondary production." (David Harding, Winton, 2016)

2.3 Futures market (Secondary Market)

On the futures market, two parties enter into an exchange-traded contract. Party one agrees to deliver a set quantity and quality of the underlying commodity, while party two agrees to purchase the commodity at the given price. In this case, delivery is not certain and parties can sell positions before delivery (Morgan Stanley, 2006). Futures exchanges are recognized and well-regulated, with transparent trading volumes and prices and almost zero credit risk. The futures markets are special because very little physical commodity is exchanged; “most of the trading is between buyers taking long positions against sellers taking short positions, with most contracts liquidated before final settlement and delivery” (Doug Casey, 2013). At the global level, the total number of futures and options traded on exchanges worldwide rose to 24.78 billion contracts in 2015 (FIA, Annual Global Futures and Options Volume).
A futures contract may adopt physical delivery or cash settlement to liquidate open positions after the maturity day. While traditionally physical delivery specification is favored, after the 1980s financialization and de-regulation of commodities markets, exchanges turned to examine cash settlement possibilities. The derivatives market is the financial market for derivatives, financial instruments which are derived from other forms of assets. The most common types of derivatives are forwards, futures, options, and swaps (Robert L. McDonald, 2002).

The market can be divided into two, that for exchange-traded derivatives and that for over-the-counter derivatives. The legal nature of these products is very different, as well as the way they are traded, though many market participants are active in both. The existence of a recognized exchange underpins the key differences between an OTC forward transaction and a futures contract. Each individual exchange will have its own set of rules and regulations, which outline the way in which futures contracts are defined and traded on that particular exchange.

In the futures market, margin refers to the initial deposit - a minimum amount of money - made into an account in order to enter into a futures contract. The minimum-level margin is determined by the futures exchange and is usually 5% to 10% of the futures contract, however, at times of high market volatility, initial margin requirements can be raised. This is important to understand that the structure of the futures market allows brokers to sell positions if fluctuations cause customers to exceed their margin limits and they don’t immediately deposit more money to restore their margins. When a position goes against a trader, brokers can demand that funds be deposited within 24 hours (or even sooner at the broker's discretion). If the funds don't appear, the broker can sell the position and liquidate the speculator’s account. The reason for that is because, at a certain level, futures exchanges have to be liquid all the time and if they run out of liquidity, the position has to be closed with immediate effect. This structure can force prices to fall more than would be indicated by supply and demand fundamentals. When the contract is liquidated, the initial margin plus or minus any gains or losses that occur over the span of the futures contract will be refunded. Futures positions are highly leveraged because the initial margins that are set by the exchanges are relatively small compared to the cash value of the contracts in question (which is part of the reason why the futures market is useful but also very risky).
On the other hand, entering a forward contract typically does not require the payment of a fee, in other words, there is no such thing as margin requirement (CFA level1).

2.3.1 Listed (Exchange-traded) Derivatives

Exchange-traded derivatives are products listed for trading on public exchanges and consist mostly of options and futures contracts, compared to OTC derivatives like credit-default swaps that are traded privately. The derivatives exchange acts as an intermediary to all transactions and acts as a guarantor, using pooled initial margin from both sides of the trade. Exchange-traded derivatives reduce counterparty risk in contrast to OTC derivatives where one party depends on the other party to fulfill its obligation (IMF, 2008). Listed derivatives typically have standard contract specifications and exchanges make pricing available on a real-time basis promoting transparency. In contrast, OTC derivatives are tailored to meet the needs of each party and lack transparency (Reuters by Elinor Comlay, 2008).

*World Commodity Exchanges (Commodity Trading Venues)*

A commodities exchange is an exchange where various commodities and derivatives products are traded. “Most commodity markets across the world trade in agricultural products and other raw materials (like wheat, oil, base and precious metals, etc.) and contracts based on them” (National Futures Association). Futures markets have evolved over the years and the tremendous growth in financial futures which was seen in the United States was mirrored globally. Existing agricultural exchanges followed the pattern set by the Chicago exchanges and developed financial products. Instruments were unfolded worldwide covering financial assets such as government bonds, short-term interest rates, and local equity indices.

The world’s primary market for copper trading is the London Metal Exchange (LME). The CME Group (COMEX) Futures, however, are the most quoted benchmark online, with prices displayed in $US per pound (MarketIndex, 2016).

*The London Metal Exchange (LME)*

The **London Metal Exchange** is the world’s premier non-ferrous metals market. Between 70% and 80% of worldwide trading (equivalent to around USD 10 billion on a daily basis) of base metals takes place on the LME. The Exchange has an international
network of warehouses for the delivery and take-up base metals. Both cash and forward trading of base metals are conducted.

Trading on the LME

Trading on LME is conducted in lots rather than metric tons. Each lot of aluminum, copper, lead, and zinc equates to 25 metric tons. The contract specifications for each metal set the quality and shape that are most widely traded and demanded by industry. Prices are quoted in US dollars, but the LME provides official exchange rates for each of the contracts in pound, yen, and euro (Alexander Davidson, 2010).

Delivery of Underlying Metal

Though all LME contracts assume delivery of the underlying metal, in practice most positions are closed out before the delivery date. Where physical delivery does take place, delivery is in the form of warrant, which entitles the holder to take possession of one lot of metal at a specified LME approved warehouse (or storage facility).

Contract specifications for LME Contracts

3. LME “Grade A” Copper contract specification

<table>
<thead>
<tr>
<th>LME Copper physical specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quality</strong></td>
</tr>
<tr>
<td>Grade A copper must conform to the chemical composition of one of the following standards:</td>
</tr>
<tr>
<td>- BS EN 1978:1998 - Cu-CATH-1</td>
</tr>
<tr>
<td>- GB/T 467-2010 - Cu-CATH-1</td>
</tr>
<tr>
<td>- ASTM B115-10 - cathode Grade 1</td>
</tr>
<tr>
<td><strong>Shape</strong></td>
</tr>
<tr>
<td>Cathodes</td>
</tr>
<tr>
<td><strong>Lot size</strong></td>
</tr>
<tr>
<td>25 tonnes</td>
</tr>
<tr>
<td><strong>Warrant</strong></td>
</tr>
<tr>
<td>25 tonnes (with a tolerance of +/-2%)</td>
</tr>
<tr>
<td><strong>Brands</strong></td>
</tr>
<tr>
<td>All copper deliverable against LME contracts must be of an LME-approved brand</td>
</tr>
</tbody>
</table>

Source: www.lme.com

2.3.2 Over-the-counter (OTC) Derivatives

OTC derivatives are private contracts that are traded between two parties without going through an exchange or other intermediaries, and therefore, they could be negotiated and customized to suit the exact risk and return needed by each party. Although this type of derivative offers flexibility, it poses credit risk because there is no clearing corporation. Assets traded OTC are usually traded by private securities dealers who negotiate directly with buyers and sellers.
For example, a swaption is a type of over-the-counter derivative because it is not traded on exchanges (ISDA, 2013). This is a type of derivative that grants the holder of the security the right to enter into an underlying swap. However, the holder of the swaption is not obligated to enter into the underlying swap.

2.3.3 Potential advantages of trading Futures vs. Spot

There are many potential advantages of trading futures versus spot. As discussed, copper futures are cleared via centralized exchange with standardized contracts and complete fiduciary transparency. Centralized exchanges are regulated by the Commodity Futures Trading Commission and the National Futures Association. By contrary, spots traded by independent dealers with varying types or grades and quantities, and trading houses are limited to the hours of operation for the dealer. Spot copper is completely deregulated as dealers set their own prices and policies, and in some cases, these prices may not reflect current world copper prices.

3. Definition of Market Actors

Basically, there are two groups of participants on futures markets with different objectives. One group are commercial traders (hedgers) such as producers, processors, and wholesalers, who aim to reduce price risks associated with selling or buying a physical commodity. The other group is non-commercial traders (speculators), who are willing to take price risks and provide liquidity in the expectancy of profits (HULL, 2002; CFTC, 2012).

3.1. Hedgers

Risk hedging is a form of insurance, locking in a price to buy or sell a commodity in the future, purchasing power protection against rising prices (NAIC, 1998). Put differently, it is the process of managing the price risk inherent in a business by offsetting that risk in the futures and options market. Managing the price risk means maintaining a greater control of the cost of inputs or revenues from sales, planning for the future based on assured costs and revenues, or eliminating concerns that a sharply adverse movement in a metal’s price could turn an otherwise flourishing and efficient business into a loss market (Shapiro, A., 1996). It can vary in complexity from a relatively simple activity through to a highly complex operation.
Hedgers are “commercials” in CFTC terminology. They have an exposure to the price of the physical commodity (as mentioned, long in the case of producers and merchants with inventory, short in the case of consumers) which they offset (usually partially) by taking an opposite position in the futures market. A hedger is traditionally considered a commercial market actor, as this strategy is largely (but not exclusively) employed by producers or consumers who wish to secure the market price of a product which will be available at a certain time in the future (Hull, 1993). Producers are the sellers of the commodity – they supply and refine raw materials. By definition, producers of commodities will always be a “natural long” (that is, they will own) the underlying commodity as their core business is growing/mining the commodity (Jack D. Schwager, 2011). In usual circumstances, the producer will sell more than it produces in the hope that commodity prices fall. The producer will then try to buy back the commodity at a lower price on the commodity exchange.

In the energy market, oil producers are exposed to volatile oil prices. For example, the drilling companies, such as Shell Oil, BP, and Exxon who refine the crude oil-based products into finished goods are exposed to the difference between crude oil prices and the prices for refined products (this is known as the crack spread). In agricultural markets, the base of producers is wider as it reaches down to all the agricultural growers across the world (Bloomberg, 2015). A potato farmer, for example, will know that their crop will be ready in 90 days, and will, therefore, sell a portion of the expected yield on the futures market in order to ensure the future price of that share of the harvest.

As for the base metals market, in order to mine the metal, producers generally have to make a significant capital investment, which is usually undertaken prior to the production and sale of the metal. As such, producers have a price exposure in that sharp declines in metal prices can result in insufficient revenues to cover the capital investment, including debt servicing. If they do not have the necessary capital to invest, base metal processors frequently collect metal residues from computer scrap, telecommunications equipment and processed in various ways to recover the metal value (The Journal of FINANCE Vol.64, 2009). Consumers, such as jewelry manufacturers convert raw/refined commodities into mass volume finished products. Their requirement to hedge is driven by the availability of substitute products and the ability to pass higher input costs to their customers. A large part of the demand for metals such as gold and platinum is driven by
the likes of jewelry manufacturers wishing to protect themselves against higher prices in the future (Oppi Untracht, 1982).

3.2 Speculators

"Speculation is the act of trading in an asset or conducting a financial transaction that has a significant risk of losing most or all of the initial outlay with the expectation of a substantial gain" (Sophia Kühnlenz, 2015, p. 29).

**Speculators, unlike hedgers, normally want to try and take advantage of the volatility associated with large price movements.** They take positions (buy and sell futures and options contracts), generally short term based on views, in an effort to profit from price trends. **For example, if speculators believe that metal prices will rise, they might buy futures contracts.** If prices do indeed rise, the speculator profits by selling the contract at the higher price. If prices fall, the speculator stands to make a loss. They generally have no desire to own the metal they trade, but assume market price risk and add liquidity and capital to the commodities market.

Speculators may be divided between those who trade on market fundamentals and those who trade on a technical basis, i.e. on the basis of past trends or other (historical data), more complicated, price patterns. Hedge funds and CTAs typically fall into this category. Many speculative traders are “spread” rather than “outright” traders, that is to say, they involve taking offsetting positions on related contracts, generally different maturities for the same future (Christopher L. Gilbert, 2007).

While both producers and consumers may wish to hedge their investments by selling/buying future contracts, they do not usually trade directly with each other, not least because there may be an issue with the liquidity of the consumer in providing enough capital for the traders.

Therefore, the buyer of futures contracts is normally a speculator looking to take a position on the market (UNCTAD, 2011). In such a way, speculators are said to provide liquidity to futures markets (Friedman 1953). Tilton, Humphreys and Radeczki split speculators into two categories, long-short, and long-only speculators. Long-short speculators are typically leveraged (they use borrowed money) investors who readily buy or sell depending on market conditions, and thus seek to make money out of both positive

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3 Commodity Trading Advisor.
and negative maker fluctuations. They include the trading desks of major banks, Hedge funds and technical investors who base their strategies on computer simulations of market conditions (algorithmic trading). Long-only speculators are typified by a fast-growing class of Index-related investors. They are generally unleveraged (they trade with their own money) and are much less sensitive to price fluctuations. They track the basket of commodities defined in the index and hold only long positions which they roll-over as the maturity of the forward contract approached. Both types of speculation in commodities have increased significantly since the 1990s, and both have led to widespread accusations of market manipulation (UNCTAD 2011; Tilton, Humphreys & Radetzki 2011).

When speaking about hedge and speculation, I must say these categories are easier to separate in principle than in practice. Some agents have mixed motives. A producer or consumer who chooses not to hedge, or who hedges on a “discretionary” basis, is implicitly taking a speculative position. Some locals may hold significant outright positions over time. Long term investors will take speculative views on commodities versus other asset classes and on specific groups of commodities (metals, energy, etc.)

3.3 Arbitrageurs

“Arbitrage is the simultaneous buying and selling of a security at two different prices in two different markets, resulting in profits without risk. Perfectly efficient markets present no arbitrage opportunities” (Nasdaq definition, 2017). Arbitrageurs basically bridge the gap between the cash and futures market by maintaining the price relationship between the underlying physical commodity and its futures market. In commodity markets, arbitrage can take the form of either cash and carry arbitrage or inter-exchange arbitrage (Perry G Mehrling, 2016). These exploit two different types of situations.

The potential for cash and carry arbitrage arises when the price of a particular forwards/future is higher than the spot price of the underlying commodity plus the costs of holding the commodity until delivery (storage, insurance, interest costs, and so on). In
this case, the arbitrage involves purchasing the underlying physical commodity and simultaneously selling its corresponding forward/futures contracts.

**Inter-exchange arbitrage** involves trading the commodity in two different locations/market, for example buying a (cheaper) copper contract on the London Metal Exchange (LME) and selling a (relatively expensive) copper future on COMEX. Arbitrageurs will buy in London and sell in Chicago, thus making easy, risk-free profit while increasing demand in one place and boosting supply in the other, and leading to an equalization in prices (Hull 1993).

In truth, arbitrage between the commodity spot and futures market is not as common as in financial markets because of the burden of purchasing and delivering the underlying commodity.

### 3.4 Investors

Investors can be institutions or individual (retail) investors who view commodities as a distinct and separate asset class in which to invest their money. In practice, it can sometimes be difficult to distinguish between the two categories, due to the fact that some high net worth private investors have considerable commodity holdings. For example, gold is the commodity of choice for many private investors for hedging inflation or stock price uncertainty. **Investors take positions (usually long and usually indirectly) in commodity futures as a component of a diversified portfolio.** This is the class of actors which appears to have grown dramatically over the two most recent decades.

Indexed and enhanced investors are pension funds and asset managers. They are mostly “long-only”. **Their motivation is a strategic allocation to a wide range of commodities, portfolio diversification, macro-economic and inflation protection and the term structure is also important for them.**

Structured investors are mostly private banks, retail or asset managers. They are “long-biased”, that is they often trade with leverage, mostly with a non-liner payoff. They usually buy baskets of commodities, ETFs, or more exotic derivatives. Their motivation is rather targeted superior performance than diversification.

Active investors are mostly Hedge Funds and CTAs. They are usually taking both long and short positions, even exotic commodities. Their motivation can be tactical (relative value), or they are simply hedging of equities/event risk.
3.5 Index Providers

Index providers are banks or financial institutions who facilitate commodity investment by providing suitable instruments, typically ETFs, commodity certificates or swaps. These institutions will generally offset much of their net positions by taking offsetting positions in the futures markets. (Morgan Stanley Commodities, 2011).

4. Financialization and de-regulation of commodities markets

There are several factors influencing commodity prices, including fundamental demand and supply side factors and macroeconomic developments. However, from somewhere around the 1980s, fundamentals did not seem to explain the severity of price movements. Hence, more attention has been given to a phenomenon which has been labeled as financialization of commodity markets (Domanski/Heath 2007). Since the 1980s, the financial industry has pursued short-term financial returns over long term goals such as technology and product development investments (Mike Collins, 2015). The term Financialization sets for “growing scale and profitability of the finance sector at the expense of the rest of the economy and the shrinking regulation of its rules and returns.” (Epstein, 2005, p.59).

As OTC derivatives trading grew during the period of financialization, the U.S. Securities and Exchange Commission (SEC) and the Commodity Futures Trading Commission (CFTC) confronted repeatedly over the regulation of these markets (Milka Kazandziska, 2003). After months of going back and forth, the laissez-faire attitude of the SEC won the ideological battle over the more conservative CFTC, and in consequence, the OTC derivative swaps ballooned. By 1998, the notional value of outstanding OTC swaps was estimated to be $80 trillion, versus the equivalent on-exchange value of $13.5 trillion (Gensler, 2010).

Instead of attempting to rein the spread of speculation across the financial markets, on 21st December 2000, the Commodity Futures Modernization Act (CFMA) was signed into law by President Clinton, which allowed many types of financial derivatives to legally trade over the counter. What is more, it also removed such over-the-counter derivatives transactions from the jurisdiction of the Commodity Futures Trading
Commission, leaving them largely deregulated. One of the consequences of this deregulation or loophole was the Enron scandal in October 2001.

In the 18 most important commodity futures markets, non-commercial traders or speculators had on average a share of 23% of total open positions in 1998 which increased to 69% in 2008 (Masters/White 2008). CFMA was the last piece of legislation required to set the stage for the Great Meltdown of 2008.

After the G20 Pittsburg summit in September 2009, both sides of the Atlantic made the commitment “to improve the regulation, functioning, and transparency of financial and commodity markets to address excessive commodity price volatility” (European Commission, COM/2011/0025).

In the United States, as a response to the financial crisis of 2007 to 2010 and subsequent bailouts, the Dodd–Frank Wall Street Reform and Customer Protection Act was passed by the congress (David Cho, January 2010). The Volcker rule -named after former Federal Reserve Chairman Paul Volcker, refers to § 619 (12 U.S.C. § 1851) is a piece of legislation that has come out of Dodd-Frank. As its core, the rule prohibits banks from short-term propriety trading in securities, derivatives, options and futures for their own accounts within the overall U.S financial system (Federal Reserve, 2016). Simply put, banks cannot use their own funds to make these types of investments to increase their profits, forcing them to serve primarily as lending institutions for customers (Forbes, 2013). Also, it aims to more closely monitor big institutions that are “too big to fail”, and to limit the types of risks they can take. Regulators firmly believe new restrictions are capable of protecting the nation from financial calamities the economy experienced during the times of the great depression (IMF, 2014). On the other hand, major banks and financial institutions see the new set of regulations extremely onerous, severely limiting liquidity and reducing the financial competitiveness of the U.S markets. In addition, there is a lack of clarity how to distinguish between forbidden speculative propriety trading and market-making hedging.

Banks often use commodities futures to hedge their investments (as discussed in section 3.2) and the Volcker rule could also be applied to them. Regulatory authorities generally do not consider concepts like gains and losses when setting new acts, and after

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4 A loophole is a gap in legislation which allows companies or traders to take advantage of a situation to avoid sanctions and therefore profit from actions which would not otherwise be possible or legal.
the final rule became effective on April 1, 2014, we have seen many investment banks losing much on giving up commodities futures positions.

However, as Marco Dunand, Chief Executive of Mercuria Energy Group Inc. shared his view to the Wall Street Journal, “it is tough for banks to trade physical commodities and they used regulation as an excuse to leave markets where they were already struggling make money, it’s not just Dodd-Frank” (WSJ, 2017).

Since only the U.S financial markets were impacted heavily by the Volcker rule, investment banks from other regions had a chance to obtain their positions. Besides that, big broker houses or other funds dealing with commodities took over portfolios. As an end result, the overall output did not change notably -due to the fact that only the counterparties became different- and therefore the impact on market prices of the underlying products was not significant.

Shortly after elected in 2016 November, Trump signaled a willingness to review Dodd-Frank laws in an effort to roll back financial regulation, saying, they were too onerous on business by holding back lending and hurting the U.S economy (Dominic Rushe, the Guardian, 2017). Since this is a law that needs to be changed by Congress, and there is strong opposition from Democrats, consumers and activist groups, at this point I doubt that any of his initiatives in regards to eliminate existing financial regulations will be warmly welcome.

In Europe, the Markets in Financial Instruments Directive (MiFID) first came into force in November 2007. EU laws on investment services “aimed at making financial markets more efficient, resilient and transparent, and at strengthening the protection of investors” (European Commission, 2015). Although MiFID created competition between investment services and brought more choice and lower prices for investors, shortcomings were exposed in the wake of the financial crisis. In June 2014, the European Commission adopted new rules revising the MiFID framework as MiFID 2 and a regulation (MiFIR). MiFID 2 aims to “reinforce the current European rules on securities markets by ensuring that organized trading takes place on regulated platforms, introducing rules on algorithmic and high-frequency trading, improving the transparency and oversight of

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5 The process was similar to an acquisition, an offer was given based on the estimate value of the portfolio.

**Position limits** are adapted to prevent large speculators from taking excessive power over the market – normally by controlling the supply-side of futures markets by taking very large positions, either long or short and thus influencing the spot price (Jayati Ghosh, 2011). Both Dodd-Frank and MiFID permit the establishment of position limits. According to Ghosh however, it is important to exempt commercial hedgers, such as metal manufacturers from such legislation as, in theory, hedgers cannot speculate. No matter how good it sounds, distinguishing hedge from speculation in practice is almost impossible. No wonder why position limits still remain a controversial challenge to the legislation.

All in all, many thinks that the deregulation of the financial industry has been one of the gravest policy mistakes in the history of the United States (Richard Duncan, 2009). It caused the Federal Reserve to lose control over credit creation, create a criminogenic environment in the savings and loan industry, and last but not least, responsible for increasing price volatility on the commodity market, which particularly affects people and economies in developing countries.

“The pressure on regulators is higher than ever” (Ralph Dicht, from KPMG, 2015). While Trump has called for a reduction of federal regulations in general, it remains to be seen how he will deal with his opponents and pass on modifications of certain laws to the congress (eg. Dodd-Frank), which they signed off before.

5. Bubble Trouble (Speculative Bubbles in History)

My research is largely focused on a potential financial bubble in current copper cash price, and hence, I paid close attention to clarify and explain the term bubble itself and the fact that people, in general, do not buy and sell according to objective criteria, but following the herd and going against their better judgment.

“Any plan conceived in moderation must fail when circumstances are set in extremes.”
– Prince Metternich
5.1 Definition of Financial Bubbles

To explain financial bubble in not very simple words, it is an extended period - a market phenomenon- during which the price of a financial asset or commodity depart significantly from economic fundamentals, rises to levels that are well above either historical norms or its intrinsic (fundamental) value, or both.

As Charles P. Kindleberger states that „bubbles always implode; by definition, a bubble involves an unsustainable pattern of price changes or cash flows”. Cliff Asness applied quantitative researcher believes that the term bubble „should indicate a price that no reasonable future outcome can justify”. In each definition, the emphasis is on the fact that the price of an asset is strongly deviates from its intrinsic value.

According to Barry Ritholtz Bloomberg columnist “we have dumbed the word down and now use it too much”. Meaning: an asset or a commodity is often declared to be in a bubble when it is only just expensive or higher than normal expected return. During 2016 we have seen record home prices in some big cities, and it came to be seen as we are again in a bubble-like situation. In fact, real estates may cost a fortune, but high prices are being filled probably by the lack of inventory in housing and not by really easy credit or home flippers⁶ speculating that prices will continue to rise.

According to Madarász, the term “Bubble” was coined in the commercial argot language to describe projects with some imaginary purpose to collect money, which was common practice in France and Britain between 1719 and 1721.

In Johnson's Dictionary⁷, which is among the most influential dictionaries in the history of the English language, “to bubble” was defined as “to cheat”. After the South Sea bubble burst in 1720, the word “Bubble” itself became a general pejorative word.

In his book⁸, Edward Chancellor went even further back in History, as long as to the medieval Europe and found some evidence that there was speculation in the Roman stock market in the 1st century.

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⁶ House flipping is a quick-profit strategy in which an investor purchases real estate at a discount price and improves the property in order to sell it at a higher price.
⁷ Published on 15 April 1755 and written by Samuel Johnson, A Dictionary of the English Language, sometimes published as Johnson's Dictionary.
⁸ The Devil Take the Hindmost: A History of Financial Speculation.
In fact, we can go even further back in the ancient Mesopotamia and find futures contracts on wheat and on other grains, mortgage and other sort of derivative financial products. However, there is no evidence of bubbles, we can be sure that there was some sort of manic activity that took place as far back as that. Activities like market manipulation and speculation have been going on for as long as the human being has been economic creatures.

Tulip mania (peaking at 1637) is generally considered the first recorded financial bubble, which related to speculation in the value of tulip bulbs. Even though, there was presumed to be some sort of mania-like behavior during the Kipper- und Wipperzeit monetary crisis. From 1619 to 1622, in their efforts to finance the Thirty Years’ War, Holy Roman Empire states manufactured low-value imitations of coins until the debased metal coins were so worthless that children allegedly played with them in the street.

Hayek, in the 1970s, opposed everything Keynes stood for. The Austrian business cycle theory telling us how business cycles occur and eventually how every boom (or bubble) will be followed by a bust. Hayekians think there is no painless recovery from an unsustainable boom and therefore the only way to have no pain is to avoid the boom itself. No matter how bubble’s existence seems to be a matter of reality and facts, there are still some economists argue that the definition itself can be used as an economic concept.

When Eugene Fama⁹ was interviewed by the New Yorker in January 2010, he simply said: “I don’t know what a credit bubble means. I don’t even know what a bubble means. These words have become popular. I don’t think they have any meaning.” He was really skeptical that the term “bubble” would be a well-defined or useful one.

As he stated in his Nobel lecture, if a bubble is determined as “an irrational strong price increase that implies a predictable strong decline,” then there’s not much evidence that such things are present in the world economy. As believed by E.Fama, for a bubble to exist, it must be predictable phenomena, and if it is foreseeable, some market participants have to notice the mispricing ahead of time, terminating price inequalities. On that basis, it does not seem that any of “this” (we have seen in the History of economic crises) was

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⁹ American economist, Nobel Prize co-winner, often referred to as “The Father of Finance”, best known for his empirical work on portfolio theory, asset pricing and stock market behaviour. (Wikipedia)
particularly predictable and therefore he argues that there is a consistent way to predict bubbles.

Reading between the lines, he thought that there was a period of price increases every day, going on and on for a long time until the smart people all know that it’s going to turn very soon, and then they give warnings that people ignore, and prices crash as they predicted.

What has just been said is called the efficient-market hypothesis (EMH), developed by Professor Fama, stating that asset prices fully reflect all available information and true economic value. A key premise of the theory is that the market reacts almost instantaneously and correctly to new information that is rapidly incorporated into the stock price, so investors cannot benefit (it is impossible to "beat the market"). Supposing that economic bubbles occur when asset prices rise far above their true economic value, the EMH cannot explain bubbles existence since the hypothesis’s assumptions about information and pricing are fundamentally contradicts with the mispricing that drives economic bubbles.

At this point, I have to bring Robert Schiller into the picture, known as one of the giants of finance, with whom Fama shared the Nobel prize in economics in 2013.\textsuperscript{10}

Chipping away at the theory of efficient markets, he concluded that rational models, in which stock prices reflect rational expectations of future payouts, are in error. His big contribution to academic finance was to point out that speculative markets, while perhaps not “so predictable,” are at least a little bit predictable. (Justin Fox, Bloomberg)

Schiller agreed that if we determine bubbles as per Fama’s definition and predictable means that we can specify the date when a bubble bursts then indeed, there may be little solid evidence that bubbles exist. Evidently, prices do not go up every day and no expert can predict when they are going to turn, with any accuracy.

But then again, this is not his definition of a bubble, for speculative markets are just not so predictable. When Schiller was interviewed by the Forbes in 2015, he said bubble refers to a period of enthusiastic bidding up of prices by a growing group of enthusiastic investors that goes on too long and is carried away by its own momentum. In a bubble,

\textsuperscript{10} Eugene F. Fama, Robert J. Shiller and Lars Peter Hansen shared the 2013 Nobel Prize in Economic Sciences for at times conflicting research on how financial markets work and assets such as stocks are priced. (Bloomberg)
eventually, people start saying, “Wait a minute…these prices are way too high! What is anyone buying anymore? What could they possibly be thinking?” And then there’s a correction and a bursting, according to him „speculative bubbles don't just pop – they may deflate and reflate” (Forbes interview with Robert Shiller, 2015 June)

All in all, Fama believes that asset price movements can be understood using economic models with rational investors, while Shiller is confident that they cannot. As far as I can see, this is just another matter of point of view, like so many other times in the history of economics (just think about the “call it fiscal or monetary policy” debate between monetarists and Keynesians.) If we take Fama’s definition of a bubble, they surely do not exist. If we take Shiller’s definition, they happen all the time.

5.2 Five Steps of a Bubble (“Here comes the boom!”)

Economist Hyman Minsky’s 1996 “Financial Instability Hypothesis” highlights five points in the life cycle of a financial bubble as per below:


Source: Kindlegerger, SC Cross Asset Research (2016).

5.2.1 Displacement

There is a typical process described by Minsky for the beginning of a bubble. Displacement refers to an exogenous shock or some new information that creates an object of speculation - some asset or financial instrument-, by which market actors get enthused and that causes corporate profits to rise.
Often, it is a new innovative technology that gets everyone excited, although Charles Kindleberger thinks it does not necessarily need to involve technological progress, the root cause can be fundamental in origin. The classic example of the displacement stage is the development of the internet market ahead of the dot-com bubble burst in 2000. In this displacement phase, smart investors notice the changes that are happening and start investing in the industry, which alerts profit opportunities.

5.2.2 Boom

Typically, a boom enlarges the money supply and results in an increase in credit channels. The keys to any bubble is to loosen up lending, just think about the cheap credit before the real estate bubble (peaked in early 2006) made by historically low interest rates.

Prices rise slowly at first, following a displacement, but then price pressure intensifies as more and more participants enter the market. “Noise traders, 11 attracted by rising share prices, enter the market and begin bidding prices even higher” (Andrei Shleifer, 2000: p. 28). During this phase, the asset in question attracts widespread media coverage and becomes the focus of investors based upon the news. One of the first media-driven herd events was the dot-com bubble, a classic example of herd following which created billionaires overnight.

5.2.3 Euphoria

During the Euphoria phase, caution is thrown to the wind, as asset prices skyrocket. The early investors have made a lot of money, and, in the words of Kindleberger, “there is nothing so disturbing to one’s well-being and judgment as to see a friend get rich” (Charles Kindleberger, 1978). Fear of missing out 12 on what could be a once-in-a-lifetime opportunity generate more enthusiasm and speculation. The "greater fool" theory 13 plays out everywhere.

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11 A noise trader also known informally as idiot trader (Krugman, Paul (2009-09-06). "How Did Economists Get It So Wrong?".) The term is used to describe an investor who makes decisions regarding buy and sell trades without the use of fundamental data.

12 Fear of missing out or FoMO is "a pervasive apprehension that others might be having rewarding experiences from which one is absent".

13 There will always be someone (a bigger or greater fool) who is willing to pay the higher price.
People get excited about the new technology so much so that they are willing to pay any price to participate. They engage in something called linear extrapolation, assuming that the trend goes up forever and they fail to think about infection points.

Valuations reach extreme levels during this phase. To stay at my example, at the height of the internet bubble in March 2000, the combined value of all technology stocks on the Nasdaq was higher than the GDP of most nations.

During the euphoric phase, new metrics and valuation techniques are created in order to justify the soaring asset prices (CMT Level III 2016).

5.2.4 Profit Taking or Crisis

Prices and profits continue to increase until smart money senses the market overheating, and begins to sell out after taking their profits. Ultimately, noise traders follow and, once a tipping point is reached, stock prices crash. As for the widely held belief that trends go on forever, that is wrong. Market actors realize that the market cannot go higher.

There are a few things might make it clear that some stock markets are extremely overpriced, but spot the exact time when a bubble is about to burst can be a difficult exercise and grossly hazardous to one's financial health, because, as the often repeated quote from John Maynard Keynes goes ‘the markets can stay irrational longer than you can stay solvent.’

Note that it only takes a relatively minor event to prick a bubble, but once it is pricked, the bubble cannot "inflate" again. The event that triggered the dot-com bubble burst was an article called ‘Burning Up’ published in the financial weekly Barron’s, listed 207 internet companies that were in dire need of cash (Barron’s, 2000). Where the press used to write only positive stories about the bubble, suddenly journalists uncover fraud, embezzlement, and abuse.

5.2.5 Panic or Revulsion

Revulsion is the final stage of the bubble cycle. This is the point when speculators try to cash in on their holdings at any price -and we know well, the price of liquidity can be sky-high in economic downturns.

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14 In this sense, smart money means informed investors (insiders) and arbitrageurs who have an understanding of the financial markets and can often spot trends before others.
Euphoric buying is replaced by panic selling, causing a massive disparity between supply and demand and further driving down asset prices, descending as rapidly as they had ascended. “As investors stay away from the bubble, prices can even fall to irrationally low levels” (John Mauldin, 2003).

The burst of the dot-com bubble again is a good example of what happened after no “greater fool” left on the market who is willing to buy higher. The NASDAQ Composite index \(^{15}\) peaked on March 10, 2000, at 5048, nearly double over the prior year. The day after, technology shares began to fall as the dot-com bubble burst.

5.3 Bubbles in History

In this section I will give an insight into the most significant financial bubbles throughout the history, the Dot-Com and the US Housing bubbles, being at once relevant and appropriate to my topic.

5.3.1 Dot-Com Bubble (1995-2001)

The dotcom era was a speculative bubble formed by the rapid rise and interest in internet companies. Around twenty years ago, the high-tech sector of the economy was growing explosively with so much hype around it that simply by adding dot com to the end of your company name (or “e” to the beginning) you could make millions of dollars.

The dot-com boom kicked off in the late ’90s, as more and more people got the Internet Explorer browser in their homes that Microsoft included in the Windows 95 Pack. (Business Insider, 2016)

The early success of e-bay and amazon did not go unnoticed on Wall Street, certain analysts started to discover how fast the web was spreading and sensing a chance to make huge profits from this boom – and also taking advantage of low interest rates- started investing millions in companies existed solely online and in warehouses. Even respected economists gave bullish investment guidelines, for example, Dr. Ed Yardeni advised during an interview: “If you don’t get on this technology boom, if you don’t compete and resent (…) you’re going to miss the whole thing”.

\(^{15}\) The NASDAQ Composite is a stock market index of the common stocks and similar securities (e.g. ADRs, tracking stocks, limited partnership interests) listed on the NASDAQ stock market.
The volume of technology IPOs was growing at a spectacular pace, sweeping the nation up in euphoria. Ambiguous buzzwords like raging bull market, social economic change, a new paradigm, information technologies, and other empty double-talk filled the mass media. No one was absolutely sure where it’s all headed, but they all want a ticket on the ride (a piece of the cyberspace) and common sense became a rarity. Seeing the growth and how much money people’s friends and family is earning, make it hard for people to resist the urge to get in the game. Investors were so excited about the progress of the internet that they invested in pretty much any tech company without having any information about the profitability of the firm or without having seen their business plans. Banks were happy to provide loans and many started buying because the stock value had gone up (which is not really a legitimate reason to buy, anyway) even knowing it was hard to determine their value since the dot-coms had no real products (Christian Wollscheid, 2012).

From 1997 to March 2000 prices went up about 5 times. At its peak, in March of 2000, Nasdaq composite was at a high of 5132.5 (as mentioned before, this was higher than the GDP of most nations) (Nasdaq, 2015). From 2000 to 2002 the index fell 80% and plummeted at 1108 in October 2002.

After the drop, which was also exacerbated by the terrorist attack of 9/11, some companies failed completely and many suffered huge losses. Businesses such as pets.com went from a market capitalization of over 300 million dollars to zero within 268 days.

**The conclusion seems to be simple, like any other mania, the dot-com bubble is fascinating human nature lesson.**

### 5.3.2 US Housing Bubble (2007-2009)

According to the standard consensus, the credit crisis arising from the bursting of the housing bubble is the primary cause of the 2007–2009 recession in the United States.

More than eight years on from Lehman Brothers’ filed for bankruptcy and “where did it all go wrong?” analysis is all the rage. Answers have varied and numerous commentators have weighed in on the major causes of the housing bubble: homeowners with questionable credit, Greenspan's loose monetary policy (bringing down the Federal Funds rate to 1%), triple-A rated Credit Default Obligations, poor regulation, malicious bankers,
and so on. In this section, I will make an attempt to summarize the primary causes of the housing bubble and the resulting credit crisis.

After the 2000 tech bubble and 9/11 terrorist attacks - in the fear of massive recession - the FED pushed the federal fund’s interest rate down to historically low levels to maintain the economic development. Low interest rate policy contributed to the housing bubble in two primary ways. First of all, adjustable (variable or floating) rate 16 mortgages (ARM) became increasingly popular, since short-term interest rates were lower than long-terms thus it provided the buyer with a low initial monthly payment. ARMs made mortgage payments affordable, what is more, desirable, and only a few seemed to care about the bitter reality, that interests can climb even the triple of their initial value in the long run. Secondly, investors could easily make profits by borrowing at low short-term interest rates and investing in high-yielding long-term assets - such as mortgage-backed securities or MBSs - which encouraged the practice of leveraging. As a result of excessive mortgage lending in 2008, the impact of the bursting of the housing bubble was extended by the degree of leverage in the economy.

Prior to the development of the housing bubble, standards for receiving mortgage loans were fairly high. The borrowers had to initiate down payments and prove that their income was sufficient to manage monthly mortgage payments. On the other hand, US Government policies have long encouraged home ownership, and in the mid-1990’s new policies were enacted, including the Community Reinvestment Act 17. In order to meet the new requirements, many banks loosened their mortgage lending standards. Down payment and income requirements were reduced, and due to the increased competition, only mortgage lenders who were willing to lower their standards could gain market share (Robert M. Hardaway, 2009). As the housing market heated up, lenders wanted to generate mortgages and the concept of the subprime mortgage was born and became widely available for the masses. A subprime mortgage is a type of loan granted to individuals with poor credit histories, meaning, banks were handing out mortgages to people with low income who can never afford them (Historically, subprime mortgages have had a foreclosure rate about ten times higher than prime mortgages). As a return of

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16 A variable-rate mortgage, adjustable-rate mortgage (ARM), or tracker mortgage is a mortgage loan with the interest rate on the note periodically adjusted based on an index which reflects the cost to the lender of borrowing on the credit markets.

17 The Community Reinvestment Act is intended to encourage depository institutions to help meet the credit needs of the communities in which they operate, including low- and moderate-income neighborhoods.
bearing the high risk that the borrower would fail to pay the debt, these mortgages usually have higher interest rates, which makes them even more profitable.

Speaking of profits, Wall Street greed and creativity facilely lead to a construction of structured credit products, such as Collateralized Debt Obligation (CDO) \(^\text{18}\) and other confusing terms, to make people think only they can do what they do. When mortgage debt is securitized, the originator of the mortgage sells it to another party, usually an investment bank, who places them in a pool and then these securities (bonds) from the pool are sold (issued) to investors. The bonds are divided into “tranches” having different characteristics in terms of risk and return. Since banks started to fill these bonds with riskier and riskier loans, investments were becoming less and less safe all the time. The reason why investors keep purchasing them is because they trusted credit agencies ratings, who usually gave AAA’s based on historical mortgage default rates for similar mortgage pools, instead of evaluating the quality of each individual mortgage. The other thing, why the rating agencies haven’t downgraded subprime bonds - however the underlying loans were clearly deteriorating - is the competition. If Standard and Poor’s (S&P) official did not give the banks the ratings they wanted, they would go to Moody’s, right down the block. The increased securitization of home mortgage debt channeled too much money into real estates and this dangerous financial structure spread across the global market.

Paul Krugman (2009) described the run on the shadow banking system as the "core of what happened" to cause the crisis. A shadow banking system refers to the financial intermediaries involved in facilitating the creation of credit across the global financial system but whose members are not subject to regulatory oversight, such as hedge funds or unlisted (or over-the-counter) derivatives. An enormous size of trading activity took place in the OTC derivatives market, which grew rapidly in the decade up to the 2008 financial crisis. In particular, the credit derivatives were the most popular including Credit Default Swap \(^\text{19}\) or CDS, which were sold as an insurance against the default of mortgage-backed securities, shifting this risk into the insurance company or other CDS seller in exchange for a certain premium. The shadow banking system became highly

\[^{18}\text{CDO}\text{ is an investment product that packages together numerous assets including mortgage-backed securities.}\]

\[^{19}\text{CDS}\text{ is a security that is effectively an insurance policy against defaults related to MBSs and CDOs.}\]
leveraged, and all these bets (speculation) resulted in an incredibly complicated web of assets, liabilities, and risks.

The new lax lending requirements and low interest rates drove housing prices higher, which made the market looked profitable, and in consequence, high risk, aggressive and irrational investments were made without adequate consideration. Many started to invest in real estate -which, as a matter of course, further pushed up the prices artificially-believing if, by any chance the borrower defaults, the bank would still have a super valuable house as collateral.

And, on the on top of everything, there was „Irrational Exuberance”. Robert Schiller (2005) defines this term as a “heightened state of speculative fervor”. What does it mean? All the participants who contributed to the housing bubble (listed above) acted on the assumption that home prices could only go one direction: up. **There was a widespread belief that the real estate market never stops growing** since, despite the rising prices, houses were regarded as a kind of necessity good. **This almost universal assumption led the participants who contributed to the housing bubble to make the decisions that created the bubble.**

The game rules were simple. Government regulators didn’t find themselves compelled to control rising property prices (they did not recognize it as a bubble, anyway), mortgage lenders had no fear, since subprime and adjustable-rate mortgages would continue to have almost zero default rates if home prices kept going up, investment bankers continued to issue highly leveraged mortgage-backed securities since they perform well due to credit ratings, and as for the agencies, they had no interest in giving worse ratings than “triple A”. Foreign investors initially focused on US government securities, but seeking for better returns, they poured billions of dollars into highly-rated mortgage-backed securities. Insurance companies sold credit default swaps (CDS) to investors against bond defaults, which was a good bargain, and finally, home buyers continued to purchase homes, often for speculative purposes, assuming that they would be able to sell the house for a profit before monthly payments became unmanageable due to the adjustable rate increase.

If real estates didn’t start to drop their value, this scheme could have gone forever. But they did. **When home prices reached an unsustainable level, - peaking in the 2nd quarter of 2006 - the bubble did what bubbles do. It burst.** Mortgage default rates
began to rise as soon as home prices began to fall. People could not keep up with “ballooning” mortgage payments - as prices fell, some borrowers had a mortgage way more than their home was currently worth and started defaulting, which increased foreclosures putting more houses back on the market for sale pushing the prices down further. There were literally no buyers, so supply was up, demand was down and house prices started collapsing. Panic set in and the bursting of the housing bubble led to enormous losses. Thanks to the complicated, deregulated OTC derivatives and other assets, when things were started going bad, they went bad for the entire financial system. Financial institutions stopped buying subprime mortgages and lenders were getting stuck with bad loans. By 2007, some major financial players (big lenders) declared bankruptcy, including Lehman Brothers. Others were forced into mergers, economies around the world began to collapse as credit froze, and the banks ultimately needed to be bailed out by the tax payers (Andrew Ross Sorkin, 2008). The crisis brought large scale recession into the global economy.

5.4 Explanation of Bubbles

"Been there, done that" – Edwin Torres, 1975

We have seen many times that the history repeats itself and still we shrug it off saying we did not see it coming. We can conclude that humans always make the same mistake not knowing what goes up must come down. Why don’t we learn from the lessons economics teaches us? Lots of people lose money of bursting bubbles, so should not we be concerned about preventing them in the first place?

For a long time, the study of how people actually made decisions was not considered important. It was always assumed people were rational and wanted the best for themselves. But this certainly did not match with general observations of how people actually acted in many situations.

Behavioral finance is a relatively new discipline that seeks to combine behavioral and cognitive psychological theory with economics and finance to provide explanations for why people make irrational financial decisions. The objective is to give investors insight into their own mistakes and those of others. In 1979, Kahneman and Tversky presented an idea called prospect theory, which contends that people value gains and losses differently, and, as such, will base decisions on perceived gains rather than perceived
losses. Thus, if a person were given two equal choices, one expressed in terms of possible gains and the other in possible losses, people would choose the former - even when they achieve the same economic end result.

Research says there is nothing like a rising market to lift our moods. Unless of course, we are not participating in that rising market. (Charles P. Kindleberger, 2005)

During the past few months, I spent a considerable amount of time reading famous economist's point of view about the psychological aspects of financial bubbles, and one of my most beloved authors turned out to be Ron Insana20, who firmly believes in the repetitive, cyclical nature of this phenomenon.

**Between 1982 and 2000, at least seven or eight bubbles of some sort took place in some market and most people rejected the notion that they were in any way similar or any way relevant to the experience we had in the late 1990s.**

Insana asserts that one of the preconditions for bubbles to exist is very easy money. The Federal Reserve increases the money supply by lowering interest rates, the stock market is going up so currency becomes cheap, and thus there is a lot of free cash floating around. In these favorable circumstances, some new technology (e.g. infrastructural development) is taking shape in the market and people greedily pick the mania envisaging that the profits and returns will be limitless. **They fail to understand that the stock and the fundamental reality can become divorced and bubbles usually break for some reason.** There is always something that cracks the market - let it be the higher interest rates or the technology simply fails to deliver on the promise - and suddenly reconnects the economic reality of the new technology to the way the markets have priced in those future profits.

However, as far as Insana is concerned, he thinks there is no harm in following trends and even participating in the rising market (buying company stocks, etc.) on the condition that you pay attention to the one dominant rule that existed all the time in the American financial history, namely, "Don't fight the Fed." The idea suggests that an investor should stay fully invested in equities when the Fed monetary policy is "easing" or "accommodative", but they need to shift away from stocks when rates begin to rise preventing the economy from overheating. In consequence, the burst of a bubble is

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20 Senior Analyst and Commentator at CNBC, one of the “Top 100 Business News Journalists of the 20th Century”.

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usually fairly easy to spot. If Fed is raising interest rates and actively trying to cool down the market, that is the time when investors should get out. And of course, they need to pay attention to the indications of suggested trends maturing as well.

Even though the recipe appears to be given on a silver platter, looks like a very few people will ever learn any lessons from the history of bubbles and manias. The one simple rule is ignored because of the most dangerous sentence in investing (in the words of Insana, a “Wall Street creature”); “This Time It’s Different!”.

In his book, Irrational Exuberance (2000), apart from structural, cultural and fundamental factors, Shiller is also turning psychology to examine the classic features of a speculative bubble and the price hikes of recent years and, trying to explain the irrational decision making when it comes to making investments.

As claimed by Prof. Schiller, people do not really know what the “right” level of the market is, moreover, what is demonstrated in Gregory Pierce’s study, getting the prices right is often a meaningless or low priority objective for them. In fact, society may intentionally choose to “get the prices wrong” in order to pursue more important goals. An obvious example of this is when both in booms and busts investors are blindly following the herd like so many sheep, with no thoughts of their own. Research shows that during significant financial events, most people are preoccupied with other personal matters, not with the financial markets at all. If they are not participating in the mania, they feel like losers and this is why they are willing to buy way overpriced assets in the first place.

Shiller’s research indicates that there are two kinds of psychological anchors, “quantitative anchors”, which give indications for the appropriate levels of the market that some people use as indications of whether the market is over- or underpriced and whether it is a good time to buy (as an example, spot price is always an important anchor), and a variety of "moral anchors", some kind of internal constraints that compels people to invest and buy stocks, a reason that they must weigh against their other uses for the wealth they already have invested in the market (known as alternative cost in microeconomics). There are a variety of psychological "moral anchors" cited by Shiller. Based on interviews with investors and various researches, he found that overconfidence plays a significant role in speculative markets, which encourages risk taking. Studies show that Investors look for familiar patterns in market behavior, without really
understanding the forces behind those patterns or carefully considered the facts backed by numbers and evidence. There is something called human inertia that makes investors incapable or slow to change their mode of thinking once established. More to the point, traders often base their decisions on stories (“good stories” or stories that seem logical) about stocks than to quantitative evidence concerning fundamentals like earnings and dividend so they tend to rely on intuition rather than facts. Unlike the decisions of an experienced chess player, Shiller asserts, "real-world decisions are clouded by emotions and a lack of clearly defined objectives, and people do not generally behave as if they have thought things through well in advance." And here comes the point; because people get their information from the same external sources, there is little or no evidence of independent behavior and this is what generates the herd behavior.

As I think, the herd mentality can also be explained (at least partially) by the term coined by Anthony Downs, rational ignorance. (1957, An Economic Theory of Democracy). Rational ignorance occurs when decision-makers deliberately choice not to gain information because the costs of doing so would likely outweigh the benefits. Because it could take years or perhaps decades until someone becomes a stock market expert or investment specialist, a bunch of people will choose to read Barron’s or PIMCO’s investment ideas instead, or some other opinion leader mediating the communication flow between investors and the stock market.
Last but not least, I would like to mention an article published in the journal Neuron with regards to Neuroeconomics helping understand financial bubbles, which is a new field, combining traditional economics with how the human brain works.

Benedetto De Martino teamed up with behavioral economists prepared a study during which they asked trader participants to make trades within an experimental bubble environment, where asset prices were higher than underlying values. There are two areas of the brain’s frontal cortex they found particularly active during bubble markets: the area which processes value judgements, suggesting that people are more likely to overvalue assets in a bubble and the other which looks at social signals and the motives of other people, showing participants are constantly trying to predict others next moves.

As well as Schiller, they end up with a conclusion that traders tend to be less driven by explicit information, like actual prices, and more focused on how they imagine the market will change and how others behave.

The disposition effect is an anomaly discovered in behavioral finance. It relates to the tendency of investors to sell shares whose price has increased while keeping assets that have dropped in value. The fact, known as the “disposition effect,” is this: when an
individual sells a stock in his portfolio, he has a greater propensity to sell a stock that has
gone up in value since purchase, rather than a stock that has gone down in value.

6. Pricing Fundamentals

In order to be able to understand all price influencing factors, there are a few theoretical concepts needs to be clarified, as per below.

6.1. Relationship between Spots and Futures

The explicit relationship between spots and future prices remains a hot topic. In general, prices in the futures market have a predictable relationship with cash or spot prices. As the settlement date approaches, the prices of the futures contract and its underlying asset must necessarily converge, so that on the delivery or settlement date, the futures price will equal the spot price of the underlying asset. Because futures contracts can be used to hedge positions in the underlying asset, a perfectly hedged position must necessarily yield the risk-free rate of return — otherwise, arbitrage opportunities would arise that would conform the rate of return to the risk-free rate of return (USSI, 2009).

\[(\text{Spot Price} + \text{Cost of Carry}) \times (1 + \text{Risk-free Premium})\]

6.2 Basis

The basis is the difference between the current cash price of a commodity and the futures price for the same commodity. If copper futures are priced at USD 3.22 per pound, and the spot price of copper is USD 3.20, the basis equals USD 0.02. „As the time to delivery passes, the futures price will change to approach the spot price. When the futures contract matures, the futures price and the spot price must be the same. That is, the basis must be equal to zero, except for minor discrepancies due to transportation and other transactions costs (Blackwell Publishing)” . Trading a basis is a critical concept in the metals market, it affects trading in base metals. Assuming a normal curve (contango market), a widening of the basis is favorable for those looking to hedge short cash market position by buying futures contracts (a widening or weakening of the basis is an increase in the difference between the futures price and the spot price). Those looking to hedge a cash market position by selling metal futures will hope for a narrowing of the basis (a narrowing or
strengthening of the basis is the reduction in the difference between the futures price and the spot price).

6.3 Types of Market: Contango and Backwardation

A market that reflects a positive carrying charge is called a market in *contango* or normal market. It *occurs when distant delivery prices for forwards/futures exceed spot prices.*

The opposite of a market in contango is a market in *backwardation* or an inverted market, which reflects a negative carrying charge and *occurs when distant forward/futures contracts are priced lower than nearby contracts.* This may reflect a tightness of supply or a strong immediate demand for the commodity. Equities and FX products are in 99% of the cases contango, while base metals markets and other commodities -for example, sugar- frequently exhibit backwardation.

![6. Market in Contango and Backwardation](image)

*Source: CFA, level1 (2014).*

Market discrepancies often mean that the actual difference between the futures price and the spot price may differ from that predicted by the cost of carrying. In practice, the forward/futures rarely reflects the full carrying charge for a number of reasons and this can make things complicated. As an example, warehouses are often willing to store commodities for their own account for less than the commercial warehouse fee (which represents a significant proportion of carrying charges) and they thus are willing to trade futures at less than cost of carrying.
6.4 Convenience Yield

Convenience yield is the benefit or implied return from holding a physical commodity instead of its derivative contract at times of high demand. In this situation, the cash price may, in fact, exceed the corresponding futures price and the actual carrying charge may be well below the expected carrying charge. When a good is easy to come by, an investor doesn't have need to own the actual good at that time and can buy or sell as he pleases. Convenience yield generally arises from the fear of either a temporary local shortage of the commodity or the interruption of a refining of production process leading to costs associated with a shutdown of a refinery or factory.

If we assume that metals have no convenience yield, then the forward price of metal should rise at the same rate as the risk-free money market rate. Hence any difference between the two curves can be attributed to convenience yield. Where there is a convenience yield, the forward price must rise at a lower rate than the risk-free money market rate. For example, assume that a trader wishes to calculate the convenience yield of Grade-A copper traded on Comex for delivery one year from today. Assume that the annual borrowing rate is 2%, the spot price of copper is $50.50 and the futures price of copper contracts expiring one year from today is $45.50. Therefore, the convenience yield is calculated to be 12.43% continuously compounded per year, or \(0.02 - \left( \frac{1}{1} \right) \times \ln\left( \frac{45.50}{50.50} \right)\).

6.5 Delivery Mechanisms

Cash-Settled contracts

In the case of a cash-settled contract, the exchange must determine a procedure for fairly estimating the market price of the underlying asset. In order to mitigate the possibility of market manipulation, the observation of the market price typically uses some form of averaging procedure. For instance, when calculating the final settlement price used for contract referencing the FTSE 100 index in the United Kingdom, NYSE.liffe takes 81 readings of the index over a 20-minute period and excludes the highest and lowest readings when calculating the average (Intercontinental Exchange, 2012). The calculations are typically made as soon as is practicable following the last trading day of a contract.
Cash settlement allowed the introduction of contracts where delivery of the underlying was difficult (for instance in the case of equity indices) or impossible (for instance, contracts have developed where values are determined by the weather) (Allen B. Paul, 1985). Major contracts were soon offered on equity indices. For example, the CME introduced a contract based on the S&P 500 index in 1982.

Physically-delivered contracts

As for physically-delivered contracts, the procedure is even more straightforward. At their chosen time during the delivery period, the holder of a short position informs the exchange of their intention to make the delivery. After this, the holder delivers payment of the final settlement price and the exchange randomly picks out a holder of a long position who is then obliged to take delivery.

Delivery times are determined in advance by the exchange, and delivery usually takes place throughout the contract month. The exchange’s rulebook will outline the particular delivery mechanism (London Stock Exchange, 2010).

6.6 Commodity as an investment

Investing in commodities can have a significant effect on market prices, so let’s see a few examples why investors make up their mind to start trading them.

Like any investment, the goal in commodities trading is to buy low and sell high. The difference with commodities is that they are highly leveraged and trade in contract sizes instead of shares.

Commodities are attractive to investors primarily due to potential hedge opportunity against inflation (Credit-Suisse, 2011). Commodities’ low correlation with other asset classes (traditional or alternative investments) makes them incredibly effective portfolio diversifiers. Finally, their return correlation with money markets is negative, and they also improve Portfolio's risk-adjusted return.

Stock-market volatility might make commodities seem like good investments. However, being a constantly changing market, commodity futures markets can be dangerous and not a place for beginners (Doug Casey, 2013). As mentioned before, commodities are often used as a risk hedge, and there are times when commodities do move opposite of stocks, although sometimes, they also move with stock prices. Commodities lost
more than stocks during the financial crisis and since that time, stocks have fully recovered while commodities have languished for more years (WSJ, 2013).

7. Copper Price Influencing Factors

7.1 Demand

With properties of malleability, ductility and resistance to corrosion, copper (Cu) is a heavily used metal across a wide range of industries and sectors. The percentage of global copper production consumed by each sector is estimated by the CDA\(^{21}\) in 2016 to be: electrical 65\%, construction 25\%, transport 7\% and other 3\%.

Because it acts as an effective conductor of heat and electricity, more than half of the copper produced is used in the electricity sector. Its core function is the transmission of power generation, thus used particularly in electrical wiring. Copper is commonly found in roofs of buildings, as well as decoratively in the design of buildings, so the construction sector is another major consumer. The red metal has a crucial role in building and developing technology in the ICT sector and also used in the battery of mobile phones and is some of the electrical components. Copper is heavily employed in infrastructure projects. It is indispensable in the railway industry, for instance, and indispensable when expanding highways, improving railways and ports. And as a good conductor of heat, it is widely used in the transport equipment industry as well, being an essential component in automobile production. A passenger car contains about 20-50 kilograms of copper, depending on the model (mainly used when constructing the motors and the breaks). The electrical appliances industry also accounts for a huge share of global copper consumption, since copper is used in refrigerators and air conditioning units for its ease of fabrication and its thermal properties (Helmi A. Youssef). And last but not least, copper is also increasingly widely used in the medical sector, because of its strong anti-bacterial properties. The escalating demand for copper from emerging markets and industrial economies such as China and India is the major factor driving investment in the copper mining market. Many nations in Asia Pacific are transforming into major industrial economies, which would boost the demand for copper in these nations. Massive infrastructure developments planned in Asia, South America and Africa are also

\(^{21}\) Copper Development Association.
anticipated to drive investments in the copper mining industry (Transparency Market Research, 2016).

7. Refined copper consumption worldwide in 2015, by region.

![Global copper consumption in 2015](image)

Source: Own edited based on USGS data (2016).

China, in particular, is, without a doubt, the largest consumer of industrial metals and accounts for about 45% of global consumption, so even a small drop in demand could leave the market awash in extra metal (Jodie Gunzberg, S&P, 2017). “The country’s massive building construction and electrical and electronic sectors consume huge volumes of copper in the production of electrical wire, pipe, personal and business electronics, and telecommunications equipment. The strong domestic output of motor vehicles, industrial machinery, and household appliances further boosts copper demand in China” (Freedonia, 2016). China’s car market decelerated in 2015 to an annual growth only 4.7%, from the annual growth rate in 2014 almost 10%. In consequence, the copper price hit six-year lows in 2016 January following a 26% decline in 2015 (Raul de Frutos, 2016).

Based on a research conducted by CME Group in 2017, it would be really difficult to understate China’s centrality to the copper market owing to the fact that copper price has more-or-less tracked Chinese GDP Growth Since 2000 (see Figure 8).
Further proving China’s dominant role in copper price trends, graph 9 captures LME copper price that often moves in tandem with the Caixin Manufacturing Purchasing Managers’ Index (PMI), which measures the performance of the manufacturing sector in China\textsuperscript{22}. The relevance of the graph is coming from the fact that manufacturing output has a strong correlation with overall economic activity. Changes in different industrial indicators (such as the purchasing managers index and industrial output) can be used to identify economic growth or decline at an early stage. When global industrial activity increases, demand for base metals (including copper) will pick up. Apparently, this will push the copper price upwards (Casper Burgering, 2016).

\textsuperscript{22} The Manufacturing Purchasing Managers Index is based on five individual indexes with the following weights: New Orders (30 percent), Output (25 percent), Employment (20 percent), Suppliers’ Delivery Times (15 percent) and Stock of Items Purchased (10 percent), with the Delivery Times index inverted so that it moves in a comparable direction. A reading above 50 indicates an expansion of the manufacturing sector compared to the previous month; below 50 represents a contraction; while 50 indicates no change (Trading Economics, 2014).
The International Copper Study Group (ICSG) released preliminary data to estimate the apparent usage of refined copper in the world in previous years, and also a forecast in regards to 2017 numbers. I found ICSG the most trustworthy source to collect demand-side data since they use an apparent demand calculation based only on reported data (production + net trade +/- Shanghai Futures Exchange stock changes) and does not take into account changes in unreported stocks. According to ICSG, in the first ten months of 2015, world apparent usage is estimated to have declined by around 1% (210,000 t). The same is estimated to have increased by around 2% (430,000 t) in 2016, and the growth was mainly due to an increase in Chinese apparent demand, as world usage excluding China is estimated to have increased by only 0.9%. Usage in the United States and Japan, the second and third leading refined copper using countries, is down by 2% and 2.5% respectively. On a regional basis, usage is estimated to have increased by 3% in Asia (when excluding China) and by 2% in Europe (by 1.5% in the EU), while declining by 3% in the Americas. For 2017, the growth in world apparent refined usage is expected at around 1%.

As a comparison, according to Citi’s more bullish analysis, in 2016, China’s real copper consumption likely rose 5.7% and for 2017, they expect Chinese copper demand to moderate to between 3-4%, driven by power grid improvement plans and vehicle sales.

After peaking in February 2011 at over $10,000 a metric ton, copper prices went on a prolonged slide, reaching seven-year lows around $4,330 a ton in January 2015 mainly due to slowing Chinese demand growth from 2006-2011 (CNBC, Huileng Tan, 2017).
the first 10 months of 2016, the decrease in the average copper price compared with that of 2015 was in large part attributed to lower consumption growth in China. (Mark Brininstool, USGS, 2017).

7.2 Supply

Copper is traded in various forms across its value chain, but essentially there are two sources of copper supply. The extraction and processing (refining) of the raw material is called ‘primary production’, while recycling of end-of-life products or copper scrap provides a so-called ‘secondary supply’ (Robert W. Bartlett, 1998). „Copper is also traded as fabricated items and as end-use products, which is a form of indirect copper trade. For example, importing electronic equipment also means the import of copper, used in its production” (Mark O'Hara, 2015: P. 12). The high rate of global copper consumption requires a high level of ongoing production. Profitable extraction depends on a large number of variables: government tax rates and regulations, inflation levels, labor wage rates, effective management of copper extraction and production firms, and cost-efficient mining techniques.

Copper is not a particularly rare metal and is consequently produced in many countries. However, unlike other basic metals like iron ore and bauxite, big copper reserves are highly concentrated.
Chart 10. shows the breakout of its natural environment worldwide, with Latin America accounting for almost half of global copper reserves. Chile - followed by Peru - is the leading producer of copper in this region and some of the world’s largest copper mines are located in this country. Chile exports 5.9 metric ton of copper, 28% of global total) so any halt to its output is likely to buoy copper’s short-term price (1.2 Mtpa mine = 3kt copper/day; generally, any supply-side event of >5% total is typically price-altering) (Goldman Sachs, 2017). Australia has the third biggest reserves of copper, and North America is also one of the prominent producers; however, over the years mining has gradually decreased in this region. Interestingly, China only has 4% of global copper reserves, although it is the world’s largest consumer. We have seen that copper mining is concentrated in Latin America, while more than half of the world’s copper is consumed in Asia. This necessitates a global copper trade (Mark O’Hara, 2015).

Major copper mining nations such as Chile and Peru are investing large amounts to boost mining productivity levels, which have to be increased in the next few years to meet the global demand arising majorly from industrial economies (see “Demand”). The market for copper mining is anticipated to grow at a considerable rate, owing to increasing investments in construction projects, which is a major consumer of copper industry (Transparency Market Research, 2015). What is still preventing major companies from
increasing their production levels, is the complexity and project cost associated with copper mining.

As per ICSG’s latest bulletin, in 2016 world mine production is estimated to have increased by around 5%, or 1 Mt (million tons), mainly due to a recovery in production levels in Canada, Indonesia, and the United States, expanded capacity in Mexico, and low frequency of supply disruptions due to strikes or adverse weather conditions. However overall growth was partially offset by a 3.8% (220,000 t) decline in production in Chile, the world’s biggest copper mine producer. On a regional basis, production rose by 6% in the Americas and 11.5% in Asia but declined by 3.5% in Africa while remaining essentially unchanged in Europe and Oceania. ICSG projections for 2017 indicate that the market should remain essentially balanced. Global refined copper production is expected to exceed consumption by 160,000 t (1%) owing to production growth of 1.7% outpacing a 1.0% growth in global refined consumption. Mine and refined production are expected to be greater than in earlier projections because previously announced production cuts have not taken place. Peru and Mexico are the main contributors to growth this year with Chile expected to contribute significantly to growth. (International Copper Study Group, Copper Market Forecast 2016/2017) All in all, the International Copper Study Group expects that world mine production will remain roughly unchanged in 2017 after a 4% increase in 2016.

The reason why copper price remains under pressure is the relatively ample availability of copper in recent times. As illustrated in chart 11, the worldwide copper production fairly steadily grew all but three of the past 22 years, which normally should cause prices to slide. Copper mining supply doubled between 1994 and 2014 (has increased 105% since 1994, when the U.S. Geological Survey began estimating global output), and probably continue to grow in 2017. While the increased production has been good for those who work in the sector, it is not necessarily very positive news for the price of the metal going forward (CME Group, 2017). Normally, it is expected that the price would drop in case of growing supply, but the opposite happened. Another interesting fact is that low prices did not cause mining production to cut down before the 2016 October hike.
To summarize ICSG’s demand and supply data for 2016 in brief (Table 12), world mine production is increased by 4%, the refined production is increased by 2.3%, while the apparent refined usage grew only by 1.5%.

Looking at the same year on the stock market (Figure 13), LME copper prices vary from 4300 to 5200 USD/mt before the hike in 2016 late October. As copper demand estimated to have increased only by around 2%, and the growth in supply is 4%, copper prices normally should not have moved from 4819 USD/mt (value on 3rd October 2016) to 6106 USD/mt (13th February 2017) (Source: Bloomberg terminal). Therefore, the sudden increase in copper price from mid-October 2016 probably cannot entirely be justified with supply and demand-side factors.
12. ICSG Copper Market Forecast 2016/2017


13. Copper spot price (1 Year on the LME)

Source: Own edited based on Bloomberg Terminal data.

7.3 Dual Demand

The price of any commodity is generally derived from demand and supply analysis. However, for certain commodities that have a dual demand (that is, a use in industry and a resale value on an exchange/market), things can be complicated. Many metal buyers
that require a metal for use will purchase future contracts to hedge prices. This will leave only a small percentage of output uncontracted at delivery, hence any price movements must be modeled off this small uncontracted portion. Interestingly, this is the most elastic part of the demand for metals, as a lot of the traders will be speculators who are very price-responsive (Carley Garner, 2015). “By 2008 the value of outstanding commodity futures contracts (totaling almost 13$ trillion) was roughly twice the real global output of commodities. For gold, copper, and aluminum in 2005, the volume of exchange-traded derivatives was around 30 times larger than physical production” (Domanski&Health, 2007: p. 56). Similar to the coin redemption paradox before Bretton Woods, there is certainly more future contracts issued on copper, than available physical storage on the earth. Meaning; if a massive number of market actors would choose delivery over cash settlement at expiry, there would not be enough copper available to physically deliver.

7.4 Economic Trends and World Trade (Doctor Copper)

Copper matters, because it is a vital part of our daily lives, and given the wide variety of its applications (see more under “Demand”), it is often suggested that the trends in the copper market are a useful leading indicator of world economic health (Robin Bhar, 2015). During stronger economic times, copper prices rise as demand is up for using copper to build things. Greater demand for copper means that industrial activity is rising, and hence that the economy is expanding. That same rising economic activity also means more demand for capital, thus interest rates rise as well. Supply and demand for risk capital affect borrowing costs, and it has a knock-on effect on long-term prices. Higher spot prices increase the earnings of borrowers, thus reducing their costs of borrowing.

Since copper is used in building construction quite extensively, we have seen a downturn movement in copper’s price before the housing bubble crashed completely in the beginning of 2008. Although the crash certainly didn’t happen overnight, the red metal was sort of telegraphing the reversal in the housing market because people were not

\[23\] redemption of dollars for gold.
ordering copper anymore and consequently the actual price of copper on the commodities exchanges was starting to fall because it was already looking ahead to the collapse. Throughout the years, copper has earned its reputation for being a good diviner of economic activity.


Source: USGS (2016).

15. Median and average sales prices of new homes sold in the United States between 1963 and 2008

Source: Business Insider (2012).

We have seen that copper may have the ability to signalize economic turning points, but a study undertaken by ABN AMRO group states that the same is somewhat true the other way around, that is, copper price has a strong long-term correlation with movements in the world trade and the economic growth.
It seems that copper is not only able to predict turning points in the global economy but when the signalized slowdown or prosperity becomes a reality, its price will be heavily affected (for example during the global financial crisis, the price of copper collapsed).

7.5 Metal Inventories and Stockpiles

Copper inventories are built up by both buyers and sellers. The sudden offloading of inventories when prices are high or the building up inventories when prices are low can distort the market on some days.

In theory, it is normal for prices and inventory levels to generally move in opposite directions. When copper producers don’t like the market price, they put their production into warehouse storage and wait for better times. When prices rise up, copper starts coming back out of inventory and onto the market. “So, watching copper inventory levels can give us insights about where the producers think a fair price is” (Tom McClellan, 2016: p.2).

The London Metal Exchange manages a global network of warehouses that stores the physical metal. However, the LME does not own warehouses and the material they contain. “It simply authorizes warehouse companies and the warehouses they operate to store LME-registered brands of metal, on behalf of warrant holders” (London Metal Exchange). This storage is quite important as it serves to fulfill redeemed contracts, and additionally, it offers a place of refuge for excess supply. Nowadays, the copper that's mined is shipped directly to the end user, thus the volume that flows through the LME warehouses is quite insignificant as far as the global trade goes. But though this warehoused supply is small, it is vitally important as a buffer between producers and consumers (Scott Wright, 2013).

LME stockpile levels are also important as they give traders an idea of the economic balance of the copper market. Low and/or declining stockpiles indicate tighter supply, whereas high and/or rising stockpiles indicate excess supply due to overproduction and/or falling demand. “LME has the ability to track stockpile levels on a real-time basis, and therefore we have an accurate fundamental read on copper’s economic balance. To

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24 Inventory sets for assets that you can sell right away. In fact, from a liquidity point of view, we could draw a parallel between inventories and cash, which is the most liquid asset class.
provide some context, over the last five years, copper has been consumed globally at an average rate of about 50k metric tons per day. So, LME stockpile levels at 500k metric tons are equivalent to 10 days' worth of copper. What is a tight economic balance, is anything less than about five days. Naturally, these factors can have an influence on copper price. As an example, “back in 2005 alarmingly-low LME stockpiles of only about one day's worth of supply is what triggered copper to break out to new all-time highs”. (Scott Wright, 2010).

An analysis by ABN AMRO of stocks of pure copper in LME warehouses and the copper price shows that there is no long-term correlation. Even so, **stock levels do have an impact on the copper price over time.** As mentioned above, when stocks are low, the price will be relatively high; and when stocks are high, the price will be relatively low. This correlation was quite strong until the financial crisis, which broke out when Lehman Brothers collapsed in 2008. But after 2008, the copper price hit a new record which was not in keeping with stock volumes at the time. This illustrated that copper price formation has become more independent from stock level developments since early 2009 (Casper Burgering, 2014). The rise in copper prices following the burst of the housing bubble was the result of a speculative response to the financial crisis itself, in an attempt to rebuild asset supply (Caballero, 2009).

16. Real copper price and LME stocks.

![Graph of copper LME stocks and price](image)

*Source: Thomson Reuter datastream, (ABN AMRO).*

7.6 Uncertainties About National Economic Policies

A significant portion of the global copper supply originates in developing countries in
South America, particularly in Peru and Chile. These nations might have cheaper labor and mining costs, but the political risks can be powerful.

One of the main sources of risk not unheard of in developing regions is worker’s strike movements. Among the issues, the unions pitting against copper-producing mines are the distribution of benefits, more specifically the terms of a new three-year pay offer contract. In other cases, export bans and licensing issues coming from local governments can cause serious output cuts as they push to add value domestically to natural resources and promote the smelting industry. To put it differently, the governments are trying to force mining producers to build smelters and only permit shipments of refined metal instead of ore concentrates in the attempt to process raw materials at the highest possible degree, keeping more added value within the country.

Any of the two cases matters, because stoppages and disruptions in top copper mines are threatening global supply and thus able to boost global copper prices.

Starting from February 2017, workers were on strike for 43 days on BHP Billiton's gigantic Escondida mine in Chile, the largest copper mine in the world responsible for about 5% of the world’s total output.

17. Escondida produced thousands of tons of copper in January 2016.

Chile’s Mining Minister Aurora Williams estimates that Escondida failed to produce more than 120,000 tons of the red metal due to the stoppage, enough to wire more than ten million cars (Laura Millan, Bloomberg, 2017). In the same month in Indonesia,
another copper producing giant, Freeport forced to cut staff and production at Grasberg - the third largest copper mine in the world- as it did not get a new mining export permit. In consequence, the global supply had been cut another 100,000 tons (Fabian Cambero, 2017). The threat of the output reductions and expectations of tighter supply pushed global copper prices higher on Shanghai Futures Exchange, as well as London Metal Exchange by nearly 2 percent, proving that economic policies may affect copper price movements over time (however, rather barely than significantly).

On a separate note, growing economic policy uncertainties tend to depress investments in fixed assets, which reduces demand for copper, causing its price to fall. However, if the uncertainties are easing, and hence risks are reduced, the copper price should receive an impulse (Casper Burgering, 2015).

All in all, what needs to be underlined here, is the fact that normally there is a trade-off between the cheapness of labor cost and the risk coming from the countries developing nature.

7.7 U.S. Presidential Elections

According to some analysis and a glance at historical trends, it may be a really good time to invest in copper when election year approaches in the States, as the outcome of that event can have a substantial positive effect on copper prices.

Republicans (Conservative Right) and The Democratic Party (Liberals) in America contradicts each other in many ways, but they surely have one thing in common; the generous promises on infrastructure spending.

Politicians generally agree that the nation's infrastructure is in desperate need of improvement. Apparently, they do not even have any other choice, as the American Society of Civil Engineers gave America's infrastructure a near failing grade after “evaluated 16 categories of infrastructure, ranging from rail to schools to airports to dams” (Jacob Pramuk from CNBC, 2016).

From the latest election, we can conclude that the state of the nation’s roads and bridges is indeed, one of the few issues on which Clinton and Trump agree, as “both candidates have highlighted the need to invest in infrastructure as a way to kickstart economic growth” (Sarah Portlock from WSJ, 2017).
Democrat Hillary Clinton has proposed spending $275 billion over the next five years on infrastructure to repair and improve roads and bridges, expand public transit, make affordable high-speed internet access available to all, airports, dams, and finally, wastewater systems. On the other hand, Trump has promised a "$550 billion program, financed through both public and private capital." (David Harrison from WSJ, 2017).

Some analysts point out that seeing Trump win boosted copper prices, however, in reality, prices were on the rise even before Trump was elected. Actually, one day before the elections the most reliable presidential polls found that the chances of Trump winning the elections are relatively poor (RealClear Politics, 2016). The reason for the hike from the 24 October is the mere fact that listening either parties’ electorates talk, market actors started speculating that a staggering amount of money is about to be spent on infrastructure regardless of who wins— if Congress goes along. “With the extraordinary circumstances surrounding this specific election, there is more speculation than is normal about what different potential outcomes will mean to the economy and both fiscal and monetary policies in the United States” (Eric Sepanek, Scottsdale bullion, 2016).

Unquestionably though, the real rally in copper prices (30% increase between October 24 and November 28) came on the back of Trump’s victory and his general support for the extractive industries. In other words, the price hike is not supply and demand driven, it is more about people thinking that Trump’s potentially going to do a lot of spending on infrastructure. Therefore, by definition, it is speculation.
All in all, following the elections in the United States, there is generally a speculation-driven upward movement in copper’s price.

7.8 New Technologies in Mining Production

Although in the eyes of the general public the mining industry is often considered ancient may not appear especially innovative, but the reality is entirely different.

The expanding market for metals at the beginning of the twentieth century required new production and processing methods. Flotation, the most effective technique of separating minerals from the terrain, emerged in Australia in 1903. Mining technological innovations such as predictive maps which use satellite signals to determine the location of potential mineralization, or casing extractor, specially designed to withdraw the metal casing from a borehole with a minimum effort rapidly spread through the world (MAC25, 2012). Unexpected changes in production methods or possible new deposits can help promote future stockpiles26 and this will ease price pressures.

7.9 Substitute Goods

Advanced use of copper substitutions is able to reduce demand by even 400,000 to 500,000 metric tons on a yearly basis, thus the availability and attractiveness of substitute goods can have an influence on copper prices as well (USGS, 2014).

When talking about copper’s substitute comes first aluminum. During days when copper price is artificially high, fuelled by speculation rather by physical demand, aluminum and plastic, both obviously cheaper than copper, are designed as major beneficiaries of substitution of the metal used in power and construction. Rising copper prices during the middle of the 2000s for example eventually led to advanced uses of aluminum as a substitute in power cables, electrical equipment and refrigeration tubes.

However, while copper is used and consumed in many different sectors and industries, this is certainly not true for other base metals: “the use of aluminum is highly concentrated in the transport equipment and packaging industries (48% of total consumption), while nickel is very reliant on the stainless steel industry (65% of final consumption) and zinc is used mainly in the construction industry (51%)” (Casper Burgering, 2015). Therefore, while there are substitutes in specific uses, there is no such thing as an ultimate substitute

25 The Mining Association of Canada.
26 Accumulate a large stock of goods or materials.
good of copper.

To sum up, high copper prices can increase the usage of substitutes by reducing demand, which definitely have impact on prices, though not momentous.

7.10 Stock Market Effect

Changes that might only seem directly related to stock markets can have a knock-on effect on metal markets because of the fact that the market is often used as a hedge.

There has been plenty of researches showing a strong correlation between copper price and the stock market. The fact that this correlation is apparent not only visually, but mathematically can be traced back to two different things.

First of all, as already mentioned in section 6.6, commodities are a bet on unexpected inflation and they tend to bear a low to negative correlation to other traditional asset classes like stocks and bonds. Because commodities prices usually rise when inflation is accelerating, many investors use them to protect the purchasing power of their capital. By adding these diverse asset classes to their portfolios, investors seek to provide multiple degrees of downside protection and upside potential (Richard Westlund, 2014). Few assets benefit from rising inflation, particularly unexpected inflation, but commodities usually do.

Secondly, using a derivatives overlay is one way of managing risk exposures arising between assets and liabilities. Commodity derivatives are often used to hedge ‘unrewarded’ risks (JP Morgan, 2011). In other words, by adding commodities to a portfolio of assets that are less volatile, investors actually decrease the overall portfolio risk due to the negative correlation and in most cases, increase their overall expected return.

To summarize, the increasing demand on the stock market for commodities aiming to hedge portfolio and/or inflation risk artificially pushes the prices up and vice versa.

7.11 Foreign Exchange and Interest Rate Effects

In recent months, the rising dollar has become a key aspect in financial markets. As widely expected, the Federal Reserve raised the target federal funds rate by 25 basis points
to between 0.50 percent and 0.75 percent during its December 2016 meeting and the policymakers also projected a three quarter-point increases for 2017, up from two previously two. Hence the trend of strengthening dollar looks likely to continue.

High interest rates reduce the price of copper through various channels. First of all, it increases the incentive for extracting today rather than tomorrow (think of the rates at which copper is mined) and along with that, decreases firms' desire to carry inventories. High rates encourage speculators to shift out of commodity contracts, for example into treasury bills. It also appreciates the domestic currency and so reducing the price of internationally traded commodities in domestic terms (even if the price hasn't fallen in terms of foreign currency). All four mechanisms work to reduce the real market price of commodities (Jeffrey Frankel, 2009).

Normally, if the fed raises interest rates or if there is an anticipation that they will do so (unlike either the European Central Bank or the Bank of Japan), US dollar is strengthening. All other things being equal, investors like to hold their assets in whatever currency pays the highest short-term rates. In this case, it makes sense to invest in dollars today to take advantage of the expected appreciation. Savers will gain more interest on the money they deposit at their bank, and therefore the economy is likely to experience falls in consumption -firms will produce fewer goods- and investment. As the U.S. dollar appreciates, this increases production costs. Strong USD is hurting manufacturing and therefore productivity, as it makes a lot harder for US producers to compete on a level playing field in international markets. The same applies to China since they are directly pegging the value of their local currency, the yuan, to the dollar. If there is a downturn in production, the demand for raw materials falls back immediately, and in consequence, the price of commodities -including copper- rebound. While this gentrification is correct, of course, it is also an oversimplification.

The benchmark pricing currency for most commodities is US dollar, thus when the value of the US dollar changes, their price in dollars will change one way or the other, independently of the value of the underlying commodity. A strong currency in the United States is favorable for raw material producing countries and exporters, such as Chile, but
the other side of the coin is that commodity consumers and importers -Chine in the first place- suffer. In other words, copper generally has a negative correlation with the greenback, that is, when the dollar gains, it becomes more expensive for oversee buyers and its price tend to fall. Lower copper prices lead to higher demand, but then normally higher demand generally forces commodity prices upwards.

The below figure shows the devaluation of local currencies of copper-producing nations that have fallen dramatically down by almost 25% from 2013 to 2015 continuing the overall depreciation trend that has been in place since May 2013 (CME Group):

19. Dollar strengthens against other currencies.

<table>
<thead>
<tr>
<th>Mine Production</th>
<th>Millions of Tons</th>
<th>% of World Production</th>
<th>2014 Change in Currency</th>
<th>2015 Change in Currency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chile</td>
<td>5800</td>
<td>31.0%</td>
<td>-13.59%</td>
<td>-14.39%</td>
</tr>
<tr>
<td>China</td>
<td>1620</td>
<td>8.7%</td>
<td>-2.54%</td>
<td>-5.35%</td>
</tr>
<tr>
<td>Peru</td>
<td>1400</td>
<td>7.5%</td>
<td>-6.53%</td>
<td>-12.36%</td>
</tr>
<tr>
<td>U.S</td>
<td>1370</td>
<td>7.3%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Congo</td>
<td>1100</td>
<td>5.9%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Australia</td>
<td>1000</td>
<td>5.3%</td>
<td>-8.23%</td>
<td>-10.91%</td>
</tr>
<tr>
<td>Russia</td>
<td>850</td>
<td>4.5%</td>
<td>-40.65%</td>
<td>-24.82%</td>
</tr>
<tr>
<td>Zambia</td>
<td>730</td>
<td>3.9%</td>
<td>-13.32%</td>
<td>-41.81%</td>
</tr>
<tr>
<td>Canada</td>
<td>680</td>
<td>3.6%</td>
<td>-8.51%</td>
<td>-16.08%</td>
</tr>
<tr>
<td>Mexico</td>
<td>520</td>
<td>2.8%</td>
<td>-11.60%</td>
<td>-14.37%</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>430</td>
<td>2.3%</td>
<td>-15.38%</td>
<td>-47.27%</td>
</tr>
<tr>
<td>Poland</td>
<td>425</td>
<td>2.3%</td>
<td>-14.19%</td>
<td>-10.52%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>400</td>
<td>2.1%</td>
<td>-2.11%</td>
<td>-9.63%</td>
</tr>
<tr>
<td>Other</td>
<td>2400</td>
<td>12.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>18725</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: CME Group (2016).*

Chile -supplying 31% of the world’s copper ore- uses its own currency, the Chilean Peso, which has been in circulation since 1975. Since 2002, the Chilean peso has been allowed to float freely against the USD, although the central bank reserves the right to intervene in special circumstances such as major depreciation crisis (Chilean Peso Depreciation) (Eduardo Thomson,2016). Historically, it has been pegged to the USD at a specific exchange rate. A strong dollar thus means weak peso, which makes Chilean export products cheaper to foreign buyers, encourage them to import more. Copper has been positively affected because a lover-valued currency causes exports to perform better. The depreciation of the peso also reflects that the U.S. dollar is gaining strength on the back
of an improving U.S. economy and growing risk aversion regarding emerging market currencies (Teresa Kersting, 2016).

The below chart edited on Yahoo finance illustrates the inverse relationship between the value of the dollar and copper price over time. The red line represents the price of the dollar index futures contract, which is the value of the dollar against a basket of other major currencies around the world. The green line is the S&P GSCI, a benchmark for commodity prices, measuring the performance of commodities over time, containing as many commodities as possible. As the chart highlights, when the dollar moves higher, commodities tend to move lower. Though the correlation is not perfect, but over time there is a significant inverse relationship.

20. Comparison of dollar value and copper price movements.

![Chart showing the inverse relationship between the value of the dollar and copper price](image)

Source: Yahoo Finance (2016).

The takeaway from here is that Foreign Exchange effects, mainly the strengthening dollar can be a significant driver of metal prices.

7.12 Stop-loss Strategies

Stop loss orders are extremely common trading tools used as a way of limiting losses, whereby the stock is sold when it falls below a minimum price level. Of course, deciding precisely where to set a stop-loss is another matter - and one that comes down to personal judgment (Justin Mamis, 2004). If the share price falls, the stop-loss will usually act as a safety net by automatically selling the holding. Investors often have the choice of using a
fixed-price stop-loss or a so-called "trailing stop", which automatically moves up in percentage terms as the price of the stock moves up.

Many investment banks that deal in metals employ stop-loss strategies or break points. As a result, certain prices could see demand for metal changing greatly for a small change in price. That is, if the price of a given commodity goes below a certain psychological border or so-called resistance level, brokers start to sell assets. In consequence, more stops can be triggered and being a self-generating process, everybody will start selling, and massive orders to sell push prices further down. Once a market moves dramatically, there are usually stops taken out, positions liquidated, margin calls issued. The self-reinforcing price dynamic can become a panic, where markets react more to fear than fundamentals (Doug Casey, 2013). Larger investment banks make capital reserve (valuation adjustment) as provision for periods of selling since the price decrease can cause serious losses for them.

A recent example from February 2015 shows that stop-loss is able to greatly distort market prices. During official trading on the London Metal Exchange (LME), copper prices jumped by over $100 due to the fact that stops were triggered after the red metal broke through its technical resistance (Metal Bulletin, American Metal Market, 2015).

Research shows that investors are vulnerable to hanging on to poorly performing stocks in the hope that they'll eventually recover. In behavioral finance, this is known as the disposition effect. With momentum strategies, this behavioral bias is potentially very costly. Using stop-losses could be a useful way of avoiding this problem - selling winning positions too soon and holding losing positions for too long.

**Though, my personal opinion is that the stop-loss strategy makes very little sense since it can seriously distort market prices and can force them to fall more than would be indicated by supply and demand fundamentals.**

### 7.13 Transactional Fees

As mentioned earlier, I work in investment banking primarily responsible for trading related transactional costs, such as clearing fee, broker commissions, and taxes.

Clearing fee is charged by a clearing house for its services, most often associated with the trading of futures. Exchange fee or transactional fee is a charge of an intermediary (such
as a broker-dealer or an Exchange) for assisting in the sale or purchase of a security. As there is only a slight difference between this two charge types, some of the Top Commodity Exchanges, for example, CME Group recently combined clearing and trading fees into a single Exchange fee, making it easier for banks and other counterparties to calculate what they pay per trade.

During my research, I was curious whether trading fees can have any impact on the spot and future prices at all. As an example, I took a 3-months copper future, using London Metal Exchange’s daily official settlement prices. Trading -for the sake of simplicity- one lot Non-Ring 3-months copper future contract would cost 0.9 USD (10x0.65+10x0.25), and given that the price is 5929.5 USD, therefore it seems highly unlikely that trading fees (exchange and clearing fees) can heavily influence future prices.


<table>
<thead>
<tr>
<th>London Metal Exchange fees and charges</th>
<th>Effective 1 January 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>The fees and charges below are exclusive of any applicable VAT.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transaction fees</th>
<th>Futures, carries, traded options and TAPOs (per leg per side per lot)</th>
<th>Fees (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract type</td>
<td>Category</td>
<td>Trading</td>
</tr>
<tr>
<td>Exchange</td>
<td>Ring/Kerb/Basis</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>Non-Ring</td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td>Short-dated carries²</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>Give-up</td>
<td>0.25</td>
</tr>
<tr>
<td>Client</td>
<td>Short-dated carries²</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>All other²</td>
<td>0.65</td>
</tr>
<tr>
<td>Option exercise/assignment</td>
<td>-</td>
<td>0.35</td>
</tr>
<tr>
<td>Cash settlement fee</td>
<td>-</td>
<td>0.08</td>
</tr>
<tr>
<td>Delivery fee</td>
<td>-</td>
<td>0.35</td>
</tr>
</tbody>
</table>


Martell and Wolf (1987) identified the major determinants of trading volume in the metal futures markets with the use of daily and monthly data. They conclude that the transaction cost is typically 0.25% of the transaction value, therefore having no or little impact on commodity futures prices.

27 In terms of options, a lot represents the number of contracts contained in one derivative security. Each contract (or lot) represents exercise rights for 100 underlying shares of common stock.
7.14 Google Trends

Google Trends is a free service, where you can enter any search term or set of words and get a readout about how that term has been used over time in search patterns, and how many people were searching for a specific item.

To prepare this chart, I took the image that the Google Trends service generates, and pasted it above a chart of copper cash prices. I did no stretching and fitting to get the time periods lined up since normally there is a little time shift between google searches and copper price movements (normally, people would search for copper’s current price level first before actually start trading the red metal).

Comparing the two graphs, they are showing the signs of similarity, especially in the period of US Elections. Google searches on the term „copper price” increased heavily from the 6th November, and we can see the same hike in copper cash prices at that time.

However, there is only a little evidence that copper prices can be influenced by google trends. It is more likely that copper price changes can have an impact on the number of google searches.

All I can say with confidence is that people generally- including the media- are not always as excited about "copper prices" as a search term than they are at other times (e.g. U.S. elections).

7.15 Trend Following

The primary purpose of this test is to investigate **whether copper’s price follows a certain kind of trend or not**. The method used throughout the literature is the ARIMA model, which stands for Autoregressive Integrated Moving Average. ARIMA models are, in theory, the most general class of models for forecasting a time series. In my case, it was performed using one specific data set; spot copper contracts traded on the LME for a one-year period (from 29/03/2016 to 28/03/2017), drilled down from the Bloomberg Terminal.

Stationarizing a time series through differencing is an important part of the process of fitting an ARIMA model. After differencing my variable (‘Last Price’), Augmented Dickey-Fuller (ADF) t-test was used to determine whether a unit root is present in the model, in other words, to see whether my time series is stationary or not (where
stationarity actually means that my averages and variances are constant over time). One curious thing about the ADF test is that here we basically want to reject the null hypothesis, as it presents it as a negative thing.

Also in my case, the null hypothesis says that my series is not stationary, which we reject since p is inferior to 0.05.

24. Augmented Dickey-Fuller model performed with gretl.

![Augmented Dickey-Fuller test](image)

Source: Bloomberg Terminal (LME copper spot prices).

This implies that after taking first differences, the time series became stationary and therefore an appropriate model input. To use a simple case, I fit an ARIMA(1,0,1) model with no regressors.
25. ARIMA model performed with gretl

Source: Bloomberg Terminal (LME copper spot prices).

As it is clear from the results shown above, according to the P-value of 'd_LastPrice' (statistically insignificant as it is superior to 0.05.), the hypothesis that the beta coefficient of 'LastPrice' is not zero is rejected. In consequence, 'LastPrice', or the price of copper is not following any trends and hence fundamental data or speculation must have been the reason for the recent rally.

7.16 Other External Factors

Other factors include changes in consumption trends, labor costs, energy costs (mainly oil) and also bad weather or trading on the black market can have an impact on ore prices and pure copper prices.

As far as the consumption trends are concerned, the growing demand for copper ore offers considerable opportunities for raw material extracting countries. The number of internet and mobile phone subscriptions, for instance has not stopped growing since the
1990ies, and the Information technology sector, highly dependent on copper, represents a growing share of the global economy. To put this into context, a mobile phone contains a considerable number, about 16 grams of copper in circuit boards, wires, connectors, and batteries. New consumption trends can influence the demand for copper directly, and, therefore, its market price.

On a weight basis, copper is the most energy-intensive non-ferrous metal after aluminum, and its production is also more energy intensive than that of iron and steel, cement, paper, and most basic chemicals (Bergmann et al., 2007). The growing dependence on energy across the chain underlines the strong correlation with the oil and electricity prices. Energy costs account for around 30% of the total cost of extracting the ore, and these costs can rise to 50% during the processing of the ores (smelting and refining). When the oil price rises, energy costs will go up, and the copper price will, therefore, rise (Peter Sainsbury, 2016). This is true above all at times when producers have sufficient pricing power and can charge the additional costs. In addition, the cost of delivery, shipping large quantities of metal is heavily affected by oil prices.

Copper cannot be used in its raw form, but instead, has to be refined. The refining of copper is an incredibly capital-intensive process as well. As discussed in section 8.10, labor costs are a high sensitive area in the developing countries. Chile mines -including Escondida- mainly employ cheap outsourced or contracted workers, but the government is planning to issue a bill with a pro-worker reform, aiming to reduce their number in production. Miners are not happy about the upcoming legislation because they believe it would increase labor costs in a sector, and what is more, the bill ultimately increases the power of unions by extending collective bargaining rights (Cecilia Jamasmie, mining.com, 2016).

Based on historical copper prices, we can conclude that the red metal is costly for the global economy. Copper mining is said to be highly profitable, since the total cost of production is approximately 2 USD/ lb (pound), while the price of sale is 4 USD/lb. For this reason, copper is also at the centre of black market trade. During 2006, the record price of copper has led to an epidemic of copper thefts swept the country with thieves robbing warehouses and stripping telephone wires to resell the metal for a profit (NICB28, 2014). On the other side of the ocean, a spate of robberies took place in Italy and Western

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Europe, as gangs of thieves seek to sell the metal to China on the black market. Claims for metal theft have since declined, but in periods when copper is high-priced, the red metal is a perfect target for scrap thieves.

Other external factors, for instance, unforeseen events like earthquakes, adverse weather conditions, and geopolitical instability can all force copper prices upwards.

### 7.17 Conclusion of Factors Affecting Copper Prices

The following summary table helps to assess the impact of the sixteen analyzed factors on copper prices:


<table>
<thead>
<tr>
<th>Strong</th>
<th>Moderate</th>
<th>Weak</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Supply</td>
<td>• Dual Demand</td>
<td>• Substitute goods</td>
</tr>
<tr>
<td>• Demand</td>
<td>• Metal Inventories and Stockpiles</td>
<td>• Transactional Fees</td>
</tr>
<tr>
<td>• Economic Trends and World Trade</td>
<td>• Uncertainties about national economic policies</td>
<td>• Google Trends</td>
</tr>
<tr>
<td>• Energy and Oil prices</td>
<td>• Stop-loss strategies</td>
<td>• Trend following</td>
</tr>
<tr>
<td>• New Technologies in Production</td>
<td>• Change in consumption trends</td>
<td></td>
</tr>
<tr>
<td>• Stock Market Effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Foreign Exchange and Interest Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• U.S Presidential Elections</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Own edited.*
8. Summary of findings and conclusion

My thesis work is concerned with the effect of non-supply, and demand related factors on commodity cash prices. More specifically, the aim of this study is to discover which other speculative forces could be setting copper prices on top of fundamentals.

Looking back at the forecast for 2016/2017, analysts did not see the raise in copper’s price coming due to the relatively ample availability of the red metal and the fact that demand was holding up well. Since there was no sign of tightness came into the market based on fundamentals, the chances of copper’s price breaking out were said to be slim. Yet, it made a big breakout to the upside on 24 October 2016, and came under pressure from many factors that were not directly of a fundamental or cyclical nature.

Searching for the hows and whys, I analysed sixteen different factors within a one-year period between 2016 and 2017 March to ascertain the degree to which these elements could have influenced copper’s price. The analysis performed on factors suggests that stock market (including speculation and equity-hedge) and foreign exchange effect (such as the strength of dollar), world trade and economic trends, U.S presidential elections (especially the extraordinary circumstances surrounding the latest election), and finally energy and oil prices have had a major impact on the benchmark price of copper. Though, the impact of metal inventories and stockpiles, uncertainties about national economic policies (such as miners’ strike movements or export bans), substitute goods and transactional fees have proven to be moderate or weak.

Based on my research, I have to seriously question the fundamentals of the run-up in copper and I mainly attribute the strong move in the red metal’s cash price from October 2016 to the Presidential Election in the United States, while of course, that isn’t the sole-responsible answer to the rise in numbers.

**Overall, the factors influencing copper prices analyzed in this report proved to be numerous. More specifically, the latest price hike from October 24, 2016, is majorly attributed to speculation, on the assumption that the rise had something to do with U.S president-elect, Donald Trump’s promise on infrastructural spending. I came to the conclusion that there has been an artificial rise in copper prices and therefore a speculative bubble has formed.**
9. References


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