A STUDY ON PRICE DISCOVERY IN INDIAN COMMODITY MARKET: AN EMPIRICAL INVESTIGATION

Thesis

SUBMITTED TO
DEPARTMENT OF RURAL MANAGEMENT
SCHOOL FOR MANAGEMENT STUDIES
BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY, LUCKNOW

BABASAHEB
BHIMRAO
AMBEDKAR
UNIVERSITY
LUCKNOW
प्रज्ञा शील करुणा
ESTABLISHED 1996

FOR THE AWARD OF THE DEGREE OF

Doctor of Philosophy

in

MANAGEMENT

Supervisor
PROF. KUSHENDRA MISHRA
HEAD OF DEPARTMENT

Research Scholar
SUDHAKAR PUSKAR
Enrollment No- 1202/15

DEPARTMENT OF RURAL MANAGEMENT
SCHOOL FOR MANAGEMENT STUDIES
BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY
(A CENTRAL UNIVERSITY)
VIDYA VIHAR, RAEBARELI ROAD, LUCKNOW-226 025
UTTAR PRADESH, INDIA

2021

DECLARATION

I, **Sudhakar Puskar,** student of Ph.D. hereby declare that the thesis titled **"A STUDY ON PRICE DISCOVERY IN INDIAN COMMODITY MARKET: AN EMPIRICAL INVESTIGATION"** has been prepared by me under the supervision of **Prof. Kushendra Mishra,** Head, Department of Rural Management, School for Management Studies, Babasaheb Bhimrao Ambedkar University (A Central University), Lucknow. No part of this thesis has formed the basis for the award of any degree, diploma or fellowship previously. Further, I declare that the material embodied in the present work is based on original research work and the appreciation to others has been duly acknowledged at relevant places. I also declare that the thesis is essentially free from all kinds of plagiarism.

(Sudhakar Puskar)
Enrolment No: 1202/15
Department of Rural Management,
School for Management Studies,
Babasaheb Bhimrao Ambedkar University,
Lucknow- 226025,
Uttar Pradesh, India.

CERTIFICATE

This is to certify that the thesis titled **"A STUDY ON PRICE DISCOVERY IN INDIAN COMMODITY MARKET: AN EMPIRICAL INVESTIGATION"** submitted by Mr.**Sudhakar Puskar** is an original research work and has not been previously submitted in part or full for the award of any other degree or diploma to this or any other university.

The thesis submitted to Babasaheb Bhimrao Ambedkar University Lucknow satisfies all the requirements as stipulated in the *Doctor of Philosophy (Ph.D.) regulations -1999 as amended in 2008/2010/2013* and it is fit for submission and evaluation for the award of the degree of Doctor of Philosophy of the University.

Date: 01/02/2021

Supervisor

Head of the Department

विभागाध्यक्ष

Acknowledgement

I would like to extend my gratitude to the many people who helped to bring this research project to fruition. First, I would like to thank my parents to support me for the study in higher education. I am also deeply grateful my supervisor Professor Kushendra Mishra, Head of the Department of Rural Management for providing me the constant guidance and supervision in Doctor of Philosophy programme. I am deeply thankful for his help, professionalism, valuable guidance and support throughout this project and through my entire programme of research that I do not have enough words to express my deep and sincere appreciation.

I am grateful to Professor M.S. Khan, Head and Dean, Department of Rural Management, School for Management Studies, for his consistent encouragement and cooperation. I take it a great privilege to avail the opportunity of expressing deep gratitude to Dr. Taruna and faculty members of the department of rural management, School for Management Studies for the help they rendered to me in carrying out this work. I also extent my heartful thanks to clerical staff and central library for their kind cooperation and providing me assistance at every step of my work. I cannot part without acknowledging the cooperation, I received form the institutions where I carried my research work. I praise enormous amount of help and cooperation from student and teachers throughout my entire filed work.

I would like to express my heartful thanks to my all colleagues who were extremely cooperative and were always by my side through thick and thin. Last but not least, I must express my very profound gratitude to my uncle for providing me support and continuous encouragement throughout my years of study. This accomplishment would not have been possible without him.

Thank You.

(Sudhakar Puskar)

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

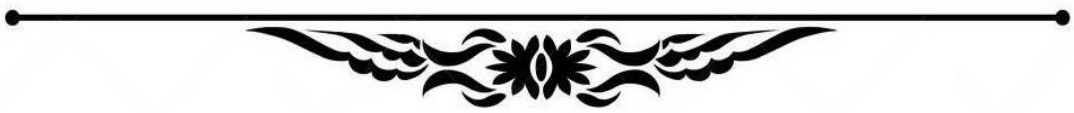
LIST OF ABBREVIATION

Abbreviation	Full-Form
VECM	Vector error correction model
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
VAR	Vector Autoregression
CDS	Credit Default Swaps
PVCEM	Panel Vector Error Correction Model
PECT	Panel Error Correction Model
ADF	Augmented Dickey Fuller
NCDEX	National Commodity and Future Exchange Limited
AMFI	Association of Mutual Funds in India
GARCH	Generalised Autoregressive Conditional Heteroskedasticity
ARCH	Auto Regressive Conditional Heteroscedasticity
SD	Standard Deviation
IS	Information Share
GIS	Generalised Information Share
EGARCH	Exponential Generalised Autoregressive Conditional Heteroskedasticity
CG	Component Share
OLS	Ordinary Least Square
OTC	Over the Counter
OI	Open interest
ECM	Error Correction Model
Dev.	Deviation
Skew.	Skewness
FutVol	Future Volume
OotVol	Option Volume
KPSS	Kwiatkowski-Phillips-Schmidt-Shin
OTC	Over the Counter
NYSE	New York Stock Exchange
CME	Chicago Mercantile Exchange
IPSTA	India Pepper and Spices trade Association

FMC	Forward Markets Commission
NMCE	National Multi Commodity Exchange
MCX	Multi Commodity Exchange
FIA	Future Industry Association
ICE	Indian Commodity Exchange

Chapter I

Introduction



CHAPTER I- INTRODUCTION

1.1. BACKGROUND OF THE STUDY

Commodity markets have undergone rapid swings over the past few years, as some of the effects of geopolitical and financial crises have reshaped the global economic balance.

Price discovery refers to the act of deciding, by observing consumer supply and demand and other factors associated with the trade, the proper price of a safe, asset, or products or services. Price discovery is a process by which specific supply and demand considerations relevant to the market decide the price for a given product or security.

Discovery of prices means discovering where supply and demand intersect. The supply curve and the demand curve in economics converge at a single price, which then causes a sale to take place. From transaction size to context circumstances of past or potential scarcity or excess, the form of such curves is subject to several variables. Place, storage, transaction costs and the psychology of buyers/sellers all play a part. Using all these parameters as variables, there is no clear formula. The formula is also a complex mechanism which, if not from trade to trade, can change frequently.

It should be considered to be the core feature of every marketplace, whether it is a financial exchange or the local farmer's market, rather than thinking price discovery to be a 'item' or a particular procedure. The market itself puts together prospective buyers and sellers, with members of each party having very different selling motives and very different styles for doing so. These markets encourage both parties to communicate by encouraging both buyers and sellers to come together, and a consensus price is created by doing so. All the players do it again without understanding it, to set the very next price, and so on.Those parties with the freshest or highest quality information can have an advantage as they can act before others get that information. When new information arrives, it changes both the current and future condition of the market and therefore can change the price at which both sides are willing to trade.

`

Price discovery refers to the act of deciding, by observing consumer supply and demand and other factors associated with the trade, the proper price of a safe, asset, or products or services. Price discovery is a process by which specific supply and demand considerations relevant to the market decide the price for a given product or security.

It is a location where shares are exchanged by publicly listed firms. The main market is where, through an initial public offering (IPO) to collect money, businesses float shares to the general public.

Once new stocks have been issued in the main market, they are exchanged in the secondary market, Where one investor buys shares from another investor at the current market price or whatever price that the buyer and seller agree on. The secondary market or the stock markets are regulated by the regulatory body. In India, the Security and Exchange Board of India controls the secondary and main markets (SEBI) (SEBI).

A stock market allows the trading in business stocks and other shares through stock brokers. Only if it is listed on an exchange can a stock be purchased or sold. It is, thus, the meeting place of the buyers and sellers of stocks. The Bombay Stock Exchange and the National Stock Exchange are India's premier stock exchanges.

The aggregation of buyers and sellers (a loose network of economic transactions, not a physical facility or a separate entity) of shares (also known as shares) containing ownership claims on undertakings is a capital market, which can include stocks listed on the public stock exchange, as well as securities only exchanged privately. Examples of the above include private firms' shares that are sold by equity crowdfunding sites to customers. Stock exchanges list common equity holdings as well as other types of debt, such as corporate and convertible bonds.

1.2. PRICE DISCOVERY VS. VALUATION

Discovery of the price is not the same as valuation. Whereas price discovery is a process driven by the economy, valuation is a mechanism driven by models. Valuation is the current value of assumed cash flows, interest rates, competitive analysis, in-place and projected technical improvements and several other considerations.

`

Equal value and inherent value are other names for valuating an asset. Some analysts can decide whether an asset is overpriced or underpriced by the economy, by matching market value to valuation. Of course, the real right price is the market price, although any variations which provide trading opportunities if and when the market price changes to incorporate any details not previously considered in the valuation models.

The method of price discovery (also called the price discovery mechanism) is the process by which buyers and sellers collaborate to determine the price of a commodity in the marketplace. Both main roles of price discovery are fulfilled by the futures and options market. In order to take advantage of such information, people with greater experience and judgement are interested in these industries. For example, as a new information arrives, maybe some positive news about the economy, the activities of speculators easily feed their information into the derivatives market, allowing the price of derivatives to adjust. Therefore, these markets indicate what is likely to happen and thus assist in better price discovery.

1.3. DETERMINATION OF PRICES

Price determination involves the determination of the quality of the products sold and of the services provided in the free market. The powers of demand and supply decide rates in a free market.

The assessment of price and the exploration of price are interrelated. The market price level is determined by price calculation, and the general price level can be high or low. However, questions and worries regarding price discovery escalate when commodity rates are poor or are dropping. One method of analysis into market exploration seeks to establish variables that describe transaction price fluctuations.

`

1.4. SPOT MARKET

A public financial instrument or asset is exchanged for instant sale on the spot market or cash market. It requires a futures market in which supply is expected at a later date.

The spot market is where financial instruments are exchanged for immediate distribution, such as commodities, currencies and shares. The exchanging of cash for a financial instrument is distribution. A futures contract, on the other hand, is focused on the arrival at a specific date of the underlying asset. Spot trading and/or futures trading can be provided by exchanges and over-the-counter markets (OTC).

Physical markets" or "currency markets" are also referred to as spot markets because trades are effectively swapped immediately for the asset." Although it can take time for the formal movement of funds between the buyer and seller, such as T+2 on the stock exchange as on other currency trades, all parties agree to the "right now" trade. A non-spot or futures exchange currently agrees to an amount, but at a later date it will take place to execute and transfer funds.

As the expiring deal means that the buyer and seller will automatically swap cash for the underlying asset, future deals in contracts that are about to expire are often also referred to as spot trades.

The spot price is considered the current price of a financial instrument. It is the price at which an instrument may automatically be sold or acquired. By publishing their buy and sell orders, buyers and sellers build the spot price. In liquid markets, as orders get filled and new ones enter the marketplace, the spot price can shift by the second.

`

Exchanges put together retailers and merchants who purchase and exchange commodities, shares, futures, options and other financial instruments. The exchange offers the actual price and amount available to traders with access to the exchange on the basis of all the orders supplied by the participants.

An example of an exchange where traders purchase and sell stocks is the New York Stock Exchange (NYSE). There is a market for spots.

An example of an exchange where traders buy and sell futures contracts is the Chicago Mercantile Exchange (CME). It is a demand for futures.

Over-the-counter transactions that exist directly between a buyer and a seller are called (OTC). This transactions are not facilitated by a centralised exchange. With an estimated daily turnover of Rs. 6 trillion, the foreign exchange market (or forex market) is the world's biggest OTC market.

The price may be dependent either on a location or a potential price / date in an OTC deal. The terms are not inherently standardised in an OTC agreement and, thus, can be subject to the discretion of the consumer and/or seller. As with markets, a central financial exchange where individuals can swap structured futures contracts is usually a futures market for OTC stock transactions; that is to say, a deal to purchase particular amounts of a commodity or financial instrument at a specific price with delivery scheduled at a predetermined time in the future.

There is an interdependence in the flow of agricultural product prices. There are many explanations for predicting future crop prices to be interdependent. Firstly, by substitutability and complementarity, agricultural product prices are related. Substitution can occur differently between crops; they can be grown at the same time, but if they are grown in the same place, they can also be finished. Suppose farmers in Uttar Pradesh cultivate both grain and wheat. Substitution will occur within regions, so wheat prices will affect gramme prices and gramme prices will affect wheat prices. In development as well as in consumption, substitutability and complementarity may occur. In production, for example, wheat and gramme are substitutes, while in consumption wheat and rice are substitutes. Preliminary draught; please do not circulate or cite production complementarity, implying that the crops are grown together. By

providing nutrients and avoiding pests, complementary crops assist in the development of other crops. Pepper is intercropped with onions, for example, and peas are cultivated with turnips, coliflower or garlic. Consumption complementarity refers to the nutritional content of the seed. Although grammes and soybeans are high in protein, cryohydrates are high in wheat. It is possible to use wheat and farm in different quantities along with soybean.

Both supplements and replacements may be agricultural goods. For eg, since they ate cultivated in the same field, wheat and mustard ate substitutes. Wheat, however, is high in carbohydrates and mustard is high in fat. The two nutrients we use for our bodies. These two crops, however, are substitutes and complement them. Thus, replaceability and complementarity in the agricultural sector are not exclusively mutually exclusive (malliaris and urrutia 1996). Secondly, in (and across) countries, basic macroeconomic factors such as aggregate demand, inflation, exchange rates and interest rates, etc., all influence agricultural product prices. Third, the co-movement of agricultural commodities is triggered by speculative behaviour, partly because imperfect capital markets 10 place liquidity limits on speculators and partly because herd behaviour on stock markets contributes to co-movement of commodity prices (Pindyck and Rotemberg 1990).

A remarkable record of success has demonstrated the progression and development of the commodity sector in India. The contours of the growth of the commodities industry are explored here, both in India and at a global level. Since this analysis will concentrate on the interrelationship between the spot market and the futures market, a summary of the characteristics of the commodity market in India will address, generally speaking, the debate on the nature of the market; the position of participants; and market governance.

`

1.5. STOCK MARKET

A stock market is an exchange where equity, bonds, and other instruments can be bought and exchanged by stockbrokers and traders. Most major firms have their shares listed on the stock market. This makes the inventory more liquid and thus more enticing to many buyers. The exchange may also serve as a settlement guarantor. Other stocks, that is, through a broker, can be sold "over the counter" (OTC). To draw foreign buyers, several major corporations will have their shares listed on more than one exchange in various countries.

Stock exchanges may also cover other types of securities, such as fixed-interest securities bonds or less frequently derivatives which are more likely to be traded OTC.

1.6. HISTORY OF STOCK MARKET

In France in the 12th century, on behalf of the banks, the courtiers de change were charged with controlling and governing the debts of agricultural societies. Since these men were also exchanging debt, they may be considered the first brokers. A common myth is that commodity traders met inside the house of a man called Van der Beurze in late 13th-century Bruges, and in 1409 they became the "Brugse Beurse" institutionalising what had been an informal meeting until then, but actually the Van der Beurze family had a building in Antwerp where such meetings took place; the Van der Beurze had Antwerp, like most merchants.

`

Venetian bankers started to invest in government securities in the middle of the 13th century. In 1351, the Venetian government banned the dissemination of speculation aimed at reducing the price of government funding. During the 14th century, bankers in Pisa, Verona, Genoa and Florence also started to invest in government securities. This was only possible because these were sovereign city-states that were not controlled by a duke, but by a council of strong citizens. Also, the first to sell shares were Italian firms. The 16th century was followed by corporations in England and the Low Countries.

1.7. COMMODITY MARKET: AN INTRODUCTION

An external object a thing which through its qualities satisfies human needs of whatever kind.

~Karl Marx

The market for commodities is a market where raw or primary materials are sold. These raw materials are exchanged on regulated markets of commodities in which they are acquired and sold on structured contracts.

1.7.1. MARKET TRADING TIMING

Agriculture commodities

Monday to Friday: 10:00 AM to 5:00 PM

1.7.2. BULLION, ENERGY & METAL COMMODITIES

Monday to Friday: 10:00 AM to 11:30 PM

1.7.3. SETTLEMENTS

Like equity the commodities market also goes thru settlements usually monthly or bimonthly in commodities the frequency of settlement differs:

e.g. bullion (gold and silver) delivery happens on 5^{th} of the expiry month.

`

Delivery starts from 1st so clients have to square off their position on last working day of the previous month of expiry month (ex. 5th March expiry, clients have to square off o 28th of Feb) and rollover to next month because:

- Liquidity dries up in the current month.
- Open position may result in delivery.
- If a client does not square off, risk will square off position (unless client gives specific intention to for deliveries).
- In Agri commodities delivery on 20th of the expiry month.
- Clients have to square off position or rollover to next month, five days before the contract expiry.

1.8. ORIGIN OF COMMODITY MARKET IN INDIA

India regulated commodity futures market began in the nineteenth century when the Bombay Cotton Trade Association began futures trading with cotton futures contracts in 1875, followed by derivatives trading in oilseeds in Bombay in 1900, raw jute and jute products in Calcutta in 1912, wheat in Hapur (1913) and bullion in Bombay (1920). Some, however, feared that derivatives fueled needless betting, and in 1939, the Government of Bombay outlawed cotton options. Furthermore, in 1943, forward trade in oilseeds and many other goods, including food crops, spices, vegetable oils, sugar and fabric, was banned.

After independence, under the Union list, the Indian Constitution specified the issue of 'Stock Exchanges and Futures Markets' and legislation called the Forward Contract

`

(Regulation) Act 1952, based on the Shroff Committee's recommendations providing a legislative basis for organised forward trading, was passed. Commodity options and cash settlement of commodity futures were banned after the implementation of the FCR Act. The first proposed potential exchange was in 1957 in Cochin by the India Pepper and Spices Trade Association (IPSTA). In much of the commodities thereafter, however, futures trading was banned.

There was a lack of goods in the mid-1960s, owing to the war in 1965 and natural calamities. As a result, futures trade in most commodities except pepper and turmeric was outlawed in 1966 to regulate the market flow of many agricultural and basic commodities. In 1977, futures trade in castor seeds was suspended.

The revival of futures trade in agricultural commodities has since been proposed by both the Dantawala Committee (1966) and the Khusro Committee (1980). The Government set up a committee in 1993, led by Dr K.N. Kabra, to investigate the role of futures markets after the 1991 reforms. The committee proposed permitting futures trade in 17 commodities. In addition, commodity futures trade was sponsored by the National Agricultural Policy (2000) and the Expert Committee on Strengthening and Growth of Agricultural Marketing (2001, GURU Committee). As of February 2003, The government lifted the ban and implemented most of the recommendations authorising futures to be exchanged in 54 bullion and agricultural commodities. Several national multi-commodity exchanges (NMCEs) have been up since 2002, using new practises such as electronic trading and clearing, in a constructive reaction to favourable policy reforms. This exchanges are governed by the Forward Markets Commission (FMC).

`

1.9. HISTORY OF COMMODITY INDEX IN INDIA

Multi Commodity Exchange of India Ltd (MCX) is located in India and is an autonomous commodity exchange. Established in 2003, it is headquartered in Mumbai.

It is India's largest commodity futures exchange where clearing and transactions of the exchange occur and the turnover of the exchange for the quarter ended September 2018 was 1.78 billion rupees. MCX sells trading options for gold and futures for non-ferrous metals, bullion, energy and other farm commodities (Mentha oil, cardamom, crude oil, palm oil, cotton, and others).

India's first listed exchange, The Multi Commodity Exchange of India Limited (MCX), is a state-of-the-art exchange of commodity derivatives that enables online trading of transactions of commodity derivatives, offering a forum for market discovery and risk management. The Exchange, which began operations in November 2003, operates under the Securities and Exchange Board of India's regulatory system (SEBI).

In 2016, MCX was seventh among the global commodity exchanges, the recent Futures Industry Association (FIA) annual data shows, in terms of the number of futures contracts traded. In 2017, MCX partnered with Thomson Reuters to create India's first co-branded commodity index collection, iCOMDEX. ICOMDEX Composite, iCOMDEX Base Metals, iCOMDEX Bullion, iCOMDEX Silver, iCOMDEX Gold, and iCOMDEX Crude Oil are part of the iCOMDEX range. A 'ComRIS' (Commodity Receipts Management System) web-based software has recently been set up by the

`

Exchange to maintain an electronic archive of goods stored in licenced warehouses on the Exchange and to ensure that real-time information is transmitted from the Exchange.

In February 2012, MCX released a public issue of 6,427,378 Rs. 10 face value equity securities in the market range of Rs. 860 to Rs. 1032 to collect about $134 million per share of equity. It was the first-ever Indian exchange IPO which made it the only publicly traded exchange for MCX India.

MCX has been governed by the Securities and Exchange Board of India since 28 September 2015. (SEBI). The Forward Markets Commission (FMC), which was merged with SEBI on 28 September 2015, controlled the previous MCX.

On 29 February 2016, the Multi-Commodity Exchange announced Mrugank Paranjape as MD & CEO of the exchange for a term of three years. Mrugank Paranjape has spent the last 14 years working for Deutsche Bank. The last time he led the bank's DB Center.

1.10. COMMODITIES TRADED INCLUDE

- Metal - Aluminium, Aluminium Mini, Copper, Copper Mini, Lead, Lead Mini, Nickel, Nickel Mini, Zinc, Zinc Mini, Brass(futures)
- Bullion - Gold, Gold Mini, Gold Guinea, Gold Petal, Gold Petal (New Delhi), Gold Global, Silver, Silver Mini, Silver Micro, Silver 1000.
- Agro Commodities - Cardamom, Cotton, Crude Palm Oil, Kapas, Mentha Oil, Castor seed, RBD Palmolien, Black Pepper.
- Energy - Crude Oil Crude Oil Mini, Natural Gas.
- On June

Global Commodity & Futures Exchange Limited (NCDEX) is a multi-commodity web exchange run professionally. NCDEX's owners include major state institutions, big public sector banks and businesses.

Present shareholders: Life Insurance Corporation of India (LIC), National Bank of Agriculture and Rural Development (NABARD), National Stock Exchange of India

`

Limited (NSE), Canara Bank, Punjab National Bank (PNB), CRISIL Limited, Indian Farmers Fertiliser Cooperative Limited (IFFCO), Shree Renuka Sugars Limited, Construct India Financial Advisors LLP, Jaypee Capital Services Limited, Oman India Joint Investment Fund, IDFC Private Equity Fund III, Star Agri Warehousing and Collateral Management Limited and shareholding by Individuals.

NCDEX includes a range of advantages that are actually in short supply in the commodity markets. In their respective fields, NCDEX shareholders are leading players and carry institutional building expertise, faith, national presence, technology and risk management skills with them.

NCDEX is a public limited corporation established under the Companies Act, 1956, on April 23, 2003. On May 9, 2003, it obtained its Certificate for Commencement of Operation. On December 15, 2003, it began operations. U51909MH2003PLC140116 is Corporate Identity No.

NCDEX is a de-mutualized online commodities exchange at the national level, powered by technology, with an independent board of directors and competent management, all of whom have no vested stake in commodity markets. It is committed to provide market investors with a world-class commodity trading network to trade in a broad variety of commodity futures powered by best global practises, professionalism and openness.

NCDEX is regulated by India's Securities and Exchange Board. NCDEX is subject to different land rules, such as the Securities Contracts (Regulation) Act, 1956, the Corporations Act, the Stamp Act, the Bond Act and various other laws.

NCDEX is based in Mumbai and offers services for its members from centres around India. As of March 31, 2019, the Exchange offered futures contracts in 19 agricultural commodities and options contracts in 5 agricultural commodities.

`

1.11. VISION

We envisage a single Indian commodities market that is powered by market forces and consistently provides all players ranging from the main producer to the end user with a level playing field; corrects past aberrations in the system; leverages technology to gain excellent efficiencies and eventually contributes to a shared global market. We also foresee a brand picture for MCX that not only lead actors in the product environment but also the general public identify it as the Trade of Preference.

1.12. MISSION

Through continuously endeavouring to raise knowledge and understanding of exchange-enabled trading in commodity derivatives, MCX will achieve the above vision. The Exchange will continue to mitigate the adverse effects of market volatility; provide neutral, safe and open trading frameworks for product ecosystem participants; devise consistency criteria and trade regulations along with the regulatory authority. In addition, a zero-tolerance policy towards unethical trade practices-attempted or real-by any participant/s-will continue to be enforced; and invest in the all-round development of the commodity ecosystem.

`

1.13. COMMODITY PRICE INDEX

The US Bureau of Labor Statistics started measuring a regular commodity price index in 1934, which became open to the public in 1940. "22 sensitive basic commodities whose markets are presumed to be among the first to be influenced by changes in economic conditions. As such, it serves as one early indication of impending changes in business activity."22 sensitive basic commodities whose markets are presumed to be among the first to be affected by economic changes. As such, it serves as an early indication of impending changes in business activity.

1.14. COMMODITY EXCHANGE

A stock market is an exchange that exchanges different commodities and derivatives. Many commodity markets worldwide trade in, and contracts dependent on, agricultural goods and other raw materials (such as wheat, barley, sugar, corn, cotton, chocolate, coffee, milk products, pig bellies, oil, metals, etc.) Such contracts can include spot rates, forwards, futures, and futures options. Interest rates, environmental securities, derivatives, or freight arrangements can be other sophisticated items.

`

TABLE 1: LIST OF LARGEST COMMODITIES EXCHANGE IN THE WORLD 1

Sr. No.	*Name of Exchange*	
1	CME Group	USA
2	Tokyo Commodity Exchange	Japan
3	Euronext	France,Belgium, Netherland, UK
4	Dalian Commodity Exchange	China
5	Multi Commodity Exchange	India
6	Intercontinental Exchange	USA, Canada, China, UK
7	Africa Mercantile Exchange	Kenya, Africa

Source: Wikipedia website

Commodities traded in the multi-commodity exchange of India and National Commodity Exchange of India are divided into the four types that are given below.

TABLE 2: TOP TRADED COMMODITIES IN THE EXCHANGE

Sr. No.	**Energy**	**Bullion**	**Metal**	**Agricultural**
1	Crude Oil	Gold	Aluminium	Chana
2	Natural Gas	Silver	Copper	Jeera
3			Lead	Chana
4			Nickel	Wheat
5			Zinc	Dhaniya

Source: Multi Commodity Exchange of India & National Commodity Exchange of India

`

1.15. PRICE DISCOVERY PROCESS

The aim of this chapter is to examine the mechanism of price discovery between future markets and spot markets for spices and base metals. This two commodity data are taken into account from the two NCEDX and MCX national commodity markets, respectively. The approach used in this research is the process of cointegration and error correction. Price discovery is one of the financial features of futures markets. This reveals knowledge via the derivatives market about potential spot prices. For the following cause, the price discovery between spot and future markets has attracted substantial interest from economists, investors and regulators; the topic is related to knowledge efficiency and arbitrage. Price exploration refers to the use of futures prices for pricing transactions on the cash market (Working 1948). Price discovery of futures markets is described by the use of futures prices to assess (future) cash market price projections (Schroeder & Goodwin, 1991). The key advantages of commodity futures markets are educated production, storage and processing decisions, according to Black (1976). The essence of the function of price discovery is to assess a reference price from which the spot market can be obtained, based on whether new knowledge is first expressed in changing futures markets or in changed cash prices. The price of futures acts as the expectation of the market for subsequent spot

A strong relationship between futures and spot markets relies on the value of market discovery. From the temporal relation between futures and spot prices, the output of the market discovery function can be determined. The causal relationship examines whether the cash market is leading the futures market, or whether the spot market is

`

leading the futures market, or whether the two markets have a bidirectional relationship. If information is first expressed in the price of futures and then in the spot price, the price of futures should contribute to the spot price, implying that the process of price discovery is done by the futures market. An significant component in the perception and management of the risk of market values for various commodities is identifying and comparing the relationship between the futures market and spot market by cost of carrying relationship.

1.16. STRUCTURE OF COMMODITY MARKET IN INDIA

Commodity market dealing takes place in two different ways, such as the Over-The-Counter (OTC) spot market and the swap market. In comparison, the position where participation is limited to persons who are involved with the asset occurs as inequities, such as the farmer, producer, wholesaler, etc., and the divisions of derivatives where trade takes place through exchange-based markets such as equity derivatives.

Currently, 23 exchanges trade in India and carry out futures trading operations on up to 146 commodity products. As per the FMC's recommendation, the Government of India accepted as nation-wide non-commodity exchanges the National Multi-Commodity Exchange (NMCE), Ahmedabad; Multi Commodity Exchange (MCX) and National Commodity and Derivative Exchange (NCDEX), Mumbai. NMCE started in

November 2002, MCX in November 2003, and NCDEX in December 2003, respectively.

1.17. STALE PRICE

The current price of a commodity that does not reflect the newly disclosed or other available stale price information is unlikely to stay stale as the information is consumed and mirrored in the price by the consumer.

1-Apr-17	OPEN	HIGH	LOW	CLOSE
ALUMINIUM	126.90	127.70	126.40	126.70
COPPER	383.10	384.50	378.30	381.10
CRUDEOIL	3260.00	3288.00	3245.00	3286.00
GOLD	28460.00	[illegible]	28420.00	28450.00
LEAD	150.05	151.85	149.40	151.00
NATURAL GAS	207.50	210.20	205.20	206.30
NICKEL	653.30	658.40	645.50	652.00
SILVER	42040.00	42360.00	41901.00	42353.00
ZINC	182.70	183.85	178.40	179.05

1.18. CRUDE OIL AND MACRO-ECONOMIC VARIABLES

Oil prices are a key leading indicator of every nation's economic stability and growth, resulting in dramatic economic shifts. Crude oil is the main global commodity with the potential to conquer the world. It also influences prices, financial and stock market movements all over the world. Therefore, the relationship of crude oil prices with major macro-economic variables such as exchange rate, forex reserve, GDP, inflation, etc. should be discussed.

`

1.19. GOLD MARKET BACKGROUND

Gold futures deals are settled with physical execution on MCX. 99.5 percent purity is the quality specification for gold trading on MCX. The gold must be serially numbered gold bars supplied by vendors accredited by the London bullion market association (LBMA) or other suppliers of MCX approved standard certificates. In the appendix, we give descriptions of regular and micro contracts.

Gold, with its beauty, liquidity, trading features, and industrial properties, is the most sought after of all precious metals obtained worldwide. As an investment vehicle, gold is usually used as a capital commodity that during the inflationary period retains its worth and buying power.

Gold has a long interesting use history in a wide variety of industries and applications. Gold offers an excellent performance in each of the ways it is used because of its special properties of being one of the most maleable and ductile metals with high melting point and fast recyclability. Gold in medicine and dentistry is a commodity of choice since it is biocompatible. It has emerged as a key nanomaterial in recent years. There are four main areas of global demand for gold: jewellery, savings, central bank deposits, and technology.

`

For gold value chain members, such as mining firms, manufacturers, gold and gold goods companies, jewellers, and even governments that depend on the proceeds of bullion consumption and trading, risk control is of vital significance. Modern hedging methods and technologies may increase efficiencies and consolidate competition, like market-based financial products for risk control, such as gold futures.

Chapter II

Review of Literature

CHAPTER II- REVIEW OF LITERATURE

2.1. INTRODUCTION

There have been several articles recently that offer new insight on finance and the economy and its associated issues. In order to identify the difference in the present research, analysis of these influential studies is indispensable. Therefore, this chapter covers a detailed and systematic analysis of relevant literature in order to obtain insight into what the commodity market is and to make the economy work better. Reviews of various academic papers, video clips and publications in both national and international journals have been embarked on, as well as many relevant and oriented books that led to the study in order to discuss the viewpoints of existing scholars related to the study undertaken a broad perspective on the study undertaken and supported to establish the research gap.

Four portions of the literature analysis and analysis are presented: First, a review of studies relevant to the Indian stock market; second, a review of studies pertaining to the efficiency checking of the financial market; third, a review of studies pertaining to the uncertainty study; and fifth, a review of studies determining the causal relationship between the spot market and the index futures market.

TABLE 3: LITERATURE REVIEW WITH MAJOR FINDINGS

Sr. No.	Name of author & Year	Major Findings
1	**Sanjay Sehgal (2019)**	The findings indicate that future markets play a dominant role in providing spot market price signals for five out of seven commodities analysed, and the shift in the 1-day lag period of future prices for most commodities has a substantial impact on the spot price transition. The research models liquidity as the unpredictable amount of future and spot stock trade. The findings suggest that sudden spot market trading

`

Sr. No.	Name of author & Year	Major Findings
		behaviour contributes to liquidity shocks in future stocks.
2	**Lisa Elliott (2019)**	For both corn and soybeans, we found that the Price Plus portfolio had the highest bushel price during the era. The Accumulator contracts in maize, alternatively, underperformed the other NGGC contracts we analysed at the average bushel price. This was partially due to a substantial proportion of bushels that did not mature and were valued at the deal expiration at the regular close. The Price Protector contract worked as well or about as well as the Price Plus contracts in both the maize and soybean markets. Compared to the other deals, the Minimum Price contracts decreased risk but rarely achieved the better price. In all asset markets, the accumulator portfolios had the strongest standard deviation in daily value changes over the contract period.
3	**Ray Endre Dahl (2019)**	In order to analyse the path and strength of spillovers through the potential crude oil and agricultural product markets, Ray assesses the static and time-varying return and volatility spillover indices to provide these players with the ability to establish optimal risk hedging strategies or to develop and enforce suitable policies that handle the fluctuations due to financial and economic turbulence.
4	**Inani K Sarveshwar (2018)**	Popular factor methods were used in this article, which were rarely used in previous literature. This paper also revealed the annual time-varying mechanism of price discovery in the Indian stock market. Finally, this paper

`

Sr. No.	Name of author & Year	Major Findings
		analyses the price discovery process in the Indian stock market with one-minute values for the longest study period of four years and eight months.
5	**Lu-Tao Zhao et. al. (2018)**	The PT and IS models used in the price discovery estimation have multiple benefits in this article, although their observations can be combined with other, more in-depth analyses. As seen in the calculations of the price discovery model, in nearly all years, price discovery is more than 80 percent. It means that there is a high degree of exploration from potential expense to spot market.
6	**David A. Carter et. al. (2017)**	Results concerning whether product risk control adds benefit are mixed in this report. Finally, diverse considerations have been found to impact the strategy of corporate hedging. These variables include funding and pay variables, as well as limited hedging methodological work in corporate risk management by business management has been reported over the past 20 years, we remember that scholarly knowledge is still quite incomplete.
7	**Inani (2016)**	The research is to measure the price discovery relationship between spot and futures prices using common factor models of four Indian commodity indices, namely the combined commodity index, metal index, oil index, and agriculture index. Spot and futures markets are found to be co-integrated with both indexes and price finding takes place on the spot market.

`

Sr. No.	Name of author & Year	Major Findings
8	**L.S. Sridhar et. al. (2016)**	The co-integration test shows that there is a co-integration of platinum, futures and spot prices and that there is one co-integration equation. The Granger causality test indicates that there is no bi-causal interaction between spot prices and futures. Therefore, the future and spot market do not mean that the spot price does not alone trigger, nor does not impact future price lags.
9	**Josy and Ganesh (2015)**	Study of the gold contract price discovery mechanism traded on the Indian commodity market. The co-integration of Johansen reveals the complex relationship between spot markets and future markets. VECM's findings show that the spot market is dominant in the field of price discovery.
10	**Etienne et. al. (2015)**	Investigate whether the speculative acquisition of index funds is contributing to commodity spot price bubbles. In both theoretical and observational grounds, they firmly refute this theory.
11	**S. Karthikeyan (2014)**	Consuming fruits is recognised as a variety of advantages for the human body. An significant position gets among numerous and which is followed by banana. The processing process is one fourth of the world's overall production of bananas. India is an important country for the cultivation of bananas and for the proper use of land for refining bananas. Countries are now introducing novel approaches for the processing of bananas.

`

Sr. No.	Name of author & Year	Major Findings
12	**Kumar (2014)**	India's agriculture sector generates about half of the national revenue. The farming industry offers workers with work opportunities. Agriculture plays a major part in a country's economic growth process. Data from secondary sources of economics and statistics for 2011-12 is obtained.
13	**Mehta (2013)**	This research analyses the consumer behaviour and price results of commodity markets in Indian Agriculture. Future commodity trade was approved in 2003. The commodity market was confronted with phenomenal growth. The research analysed nine commodity data for the period 2009-2010 on average monthly future prices. The productive approach followed by the market improves high productivity levels.
14	**Srinivasan (2013)**	The study demonstrated the presence of trade-off between the future price and the underlying spot price of the commodity markets and also showed that while the bi-directional volatility spill over continues, in the case of all MCX commodity markets, the volatility spill from spot to future market is dominant.
15	**Baldi et. al. (2013)**	For a long time, he analysed the long-term relationship in the centre of the spot and prospects costs for maize and soybean, which illustrates the breaks associate with occasions that have profoundly affected the availability and desire of maize and soybeans for reasons of nutrition and vitality.

`

Sr. No.	Name of author & Year	Major Findings
16	**Zheng. Xu et. al. (2012)**	In the latest exchange system using standard OLS and blunder rectification models, the short and long-term value mix was inspected in light of details from 2003 to 2010. The result showed that the Chinese non-GMO soyabean fates market sector is efficient in the light of knowledge, prospects costs respond adequately to exogenous value stuns, and that after these prospects costs, money costs pass.
17	**Figuerola-Ferretti et. al. (2010)**	Shaping the long-term relationship between spot markets and future prices. Based on market equilibrium, they consider a reflection of bivariate error correction that helps them to catch backwardation and contango instances, as well as detect which price is dominant in the process of price discovery. They found that in higher liquid futures markets, most of the metals they analyse are backward and futures rates are data dominant.
18	**Chen et. al. (2010)**	They find that a limited number of exporters' floating exchange rates (caused by Granger) have been useful in predicting world primary product prices, both in sample and out-of-sample terms. The reverse relation, on the other hand, does not hold out-of-sample.
19	**Nath Golaka C and Lingareddy T (2008)**	During 2005 to 2007, the effect of future trade on agricultural commodity prices was analysed and, on the basis of the Linear Regression and Granger Causality Test, it was concluded that the rise in spot prices during the future trading cycle was important in the case of urad, as it was not relevant in the case of grammes.

`

Sr. No.	Name of author & Year	Major Findings
20	**Gupta Kapil and Singh Balwinder (2007)**	By applying Granger Causality and Vector Auto Regression (VAR) to the regular closing values of the near-month index and stock futures of Nifty futures from 12 June 2000 to 30 June 2006, the conclusion was drawn that the futures market is leading the cash market.
21	**Ferretti et. al. (2006)**	In their study on LME aluminium, copper, nickel, lead and zinc traded metals by applying econometric data techniques, they concluded that in the case of aluminium, copper, nickel and zinc, futures prices are the most efficient to reflect the balance of supply and demand, whereas lead spot prices are the main contributors.
22	**Chopra and Bessler (2005)**	The price discovery of the black pepper market for the period from October 2001 to February 2003 was analysed using the cointegration and error correction process technique. The knowledge was categorised as location, nearest futures and first far-flung futures. The findings strongly show that the centre of price discovery is the futures markets.
23	**Kumar and Sunil (2004)**	The market discovery was investigated at six Indian commodity markets for five commodities. Econometric analysis was carried out using daily futures and equivalent ready market details for three contracts, each for five sample commodities (castor seed, gur, cotton, pepper and groundnut). The information was derived from primary as well as secondary sources. The primary data was based on a visit in June 2003 to two exchanges in Hapur and Muzaffarnagar.

`

Sr. No.	Name of author & Year	Major Findings
24	**Kenourgios (2004)**	This paper analysed price discovery using cointegration and error correction methods in the Athens derivatives exchange for the FTSE/ASE-20 futures market. The details for the three-month futures contracts was considered for the period from August 1999 to June 2002. The findings reveal the existence of bidirectional causality between the spot index and the markets of the futures index.
25	**Yang et. al. (2001)**	The results found that asset storability does not influence the long-term relationship between the share of cash and futures prices and the share of futures markets and provides cash markets with some long-term pricing knowledge for all non-storable commodities. They also concluded that futures markets for two out of three non-storable commodities were not unbiased forecasts for cash prices.
26	**Mallikarjunappa and afsal (2007)**	The volatility effects of the launch of derivatives on the Indian stock market using the S&P CNX IT index were analysed and it was observed that the volatility of the market increased to different degrees before and after derivatives and futures listings through clustering and persistence of volatility.
27	**Gannon (2010)**	It develops simultaneous models of volatility that enable volatility and volume of trade effects to be simultaneous and unidirectional. To test these impacts, intraday data is used from the Australian cash index and index futures markets.

`

Sr. No.	Name of author & Year	Major Findings
28	**Athanasios (2010)**	The complex relationship between the FTSE/ASE-20 spot market index, the futures price index FTSE/ASE-20 and their respective volatility was investigated. The empirical findings give clear evidence that the complex association between projected trading activity and the uncertainty of the underlying market is distinguished both by feedback and at the same time.
29	**Debasis (2011)**	The long-term relation between spot prices and futures prices is analysed. The analysis found that each of the chosen firms has a single long-term partnership across the six industries.
30	**Theissen (2011)**	The topic of price discovery in spot and futures markets was revisited. He used a threshold error correction model to allow arbitrage opportunities to have an effect on the return dynamics. It has been observed that in the process of price exploration, the futures market leads.
31	**Barua et. al. (1994)**	A comprehensive assessment of the private corporate loan market, the public sector bond market and the economy. India's bond market, markets for mortgage finance and other debt markets. This provides a diagnostic overview of the Indian debt market situation and recommends the measures expected to boost the secondary debt market.
32	**Naresh G (2006)**	Dynamic trends in demand for derivatives, especially Futures & Options, have been analysed and possible risks to the financial system continue to encourage discourse on the proper management of these instruments.

`

Sr. No.	Name of author & Year	Major Findings
33	**Buguk et. al. (2003)**	The instability in the main input market of soybean and maize spillovers to the fed and fed catfish markets has been investigated to an extent. In the U.S. catfish supply chain, market volatility spillovers were analysed based on monthly price details for catfish produce, its products, and farm and wholesale catfish from 1980 to 2000.
34	**Kumar and Sunil (2004)**	The market discovery was investigated at six Indian commodity markets for five commodities. Econometric analysis was carried out using daily futures and equivalent ready market details for three contracts, each for five sample commodities (castor seed, gur, cotton, pepper and groundnut). The information was derived from primary as well as secondary sources. The primary data was based on a visit in June 2003 to two exchanges in Hapur and Muzaffarnagar.
35	**Kim, Salem, and Wu (2015)**	They concentrate on planned macroeconomic news releases and research the effect on sovereign CDS spreads and spread uncertainty of domestic and spillover macroeconomic news from the U.S., the Eurozone, and China. They find that positive news lowers spreads of sovereign CDS, while poor news boosts spreads. Good news, especially during times of crisis, has stronger results. When both good and bad domestic news is released, CDS spread volatility rises, but good news has more pronounced results. In other nations, macroeconomic news from big countries has had a spillover effect on the sovereign CDS market.

`

Sr. No.	Name of author & Year	Major Findings
36	**Jiang, Konstantinidi, and Skiadopoulos (2012)**	They analyse the impact of the U.S. and the European planned (unscheduled) news releases on volatility spillover through the U.S. and the European stock markets. Their unplanned news includes financial news that can shock financial markets dramatically, political news, and news about physical disasters and threats to human life. They record that planned (unscheduled) news releases minimise (amplify) ambiguity of information, allowing implied volatility to decrease (increase). Spill-over uncertainty can not be completely explained by press reports.
37	**Mun (2012)**	This report explores the collective reaction to macroeconomic shocks in stock and foreign exchange market returns in the U.S. and Japan. The results suggest that the U.S. stock market responds to domestic macroeconomic surprises asymmetrically, but is not influenced by Japanese macroeconomic surprises. The surprise in the foreign exchange market is also impacting both the U.S. and Japanese financial markets.
38	**Galil and Soffer (2011)**	They concentrate only on improvements in corporate ratings and investigate the reaction of the CDS sector to rating updates after adjusting for public and private information presence. They support the previous findings that CDS spreads response significantly after reports of rating improvements and rating ratings. Negative news has also been published, Stronger than good news effect.

`

Sr. No.	Name of author & Year	Major Findings
39	**Chen and Gau (2010)**	They use the data share of Hasbrouck (1995) and the part share of Gonzalo and Granger (1995) to calculate the contribution to price discovery. In reaction to expected macroeconomic announcements, they also use linear regression to research which sector, spot or future for EUR-USD and JPY-USD will change more quickly. Their findings suggest that futures markets change more quickly than spot prices during planned macroeconomic updates.
40	**Brenner, Pasquariello, and Subrahmanyam (2009)**	They analyse the short-term reaction to the first announcement of U.S. macroeconomic shocks from the U.S. stock, treasury, and corporate bond markets. The effect of news on the stage, uncertainty, and co-movement of the a899ssets is evaluated. In their responses to the release of macroeconomic shocks, their findings suggest a major disparity between the stock and bond markets. In addition, various responses to the data quality of macroeconomic shocks are provided by the conditional mean, uncertainty and co-movement between stock, treasury, and corporate bonds.
41	**Andersen, Bollerslev, Diebold, and Vega (2007)**	They are studying the real-time effect on the U.S., German, and British stock, bond, and foreign exchange markets of the U.S. macroeconomic news shocks. They notice the surprises in the announcement produce conditional mean jumps. They also record, even after monitoring macroeconomic announcement impacts, extremely important contemporaneous cross-market and cross-country exchanges.

`

Sanjay Sehgal (2019) In all commodities, except for Kapas, there is a long-term balance relation. This outcome is contradictory to Roy's results (2008). Wheat stocks were not in a long-run equilibrium relationship, according to Roy (2008). Then the goods with a cointegrating partnership are checked for short-term transition processes. VECM studies the pace of transition of both the markets and the effect of lags fading out. The findings show that future stocks play a dominant position in delivering market spot price signals for five out of seven analysed commodities. And for most goods, the shift in the 1-day latency time of future prices has a major influence on the spot price change. Compliance with Mahalik et al. (2009) that the spot led to the potential demand in India for agricultural commodities. The results of the analysis further indicate that the spillover of volatility from one sector leads to a rise in volatility from another market. The research models liquidity in part 2 as the unexpected volume of exchange for the future and the spot market. The findings show that unpredictable spot market trading behaviour results in potential market liquidity shocks for five commodities, namely Channa, Gaur Crop, Soybean, Pepper and Refined Soy Oil. For spillover liquidity, the rise in the unexpected shock in one market leads to a fall in the liquidity of the other market.

Lisa Elliott (2019) Five NGGC contracts were compared in terms of their ability to raise return and decrease risk for 10,000 bushels of soybeans and maize between 2008 and 2017. We produced approximately 25,000 synthetic NGGC contracts during the duration to compare the risk reduction and return adjustments. We found that the Price Plus portfolio had the best bushel price during the period for both corn and soybeans. Alternatively, the Accumulator contracts on maize underperformed the other NGGC contracts that we evaluated at the average bushel price. This was largely attributed to a large number of bushels that did not mature and were priced at the standard close at the expiration of the contract. In both the corn and soybean markets, the Price Protector contract worked as well or almost as well as the Price Plus contracts. The Minimum Price contracts reduced risk compared to the other deals, but the better price was rarely achieved. In both commodity markets, the Accumulator portfolios have the highest standard deviation of regular valuation adjustments over the contract duration. Conversely, the Price Protector contracts and Minimum Price contracts offered the most cost avoidance. Due to shifts in basic carryover stocks and adverse weather during the

`

growing season, the extent of risk reduction was primarily dependent upon demand fluctuations.

Ray Endre Dahl (2019) Using an ARMA (1,0)-GARCH(1,1) definition and Diebold and Yılmaz (2009, 2012, 2014, 2015) spillover index, to analyse the return and uncertainty spillover impact on future crude oil and ten main agricultural commodities markets. Specifically, to analyse the trajectory and severity of spills through the futures markets, we measure the static and time-varying return and volatility spillover indices. Knowing the temporal dynamics of spillover fluctuations among the future crude oil and agricultural commodity markets gives these players the ability to build optimal risk hedging strategies or to develop and enforce suitable policies Which accommodates the gaps due to economic and financial turbulence. Investors can, for example, be involved in evaluating the relation between assets to diversify their investment and minimise the risk.

Inani K Sarveshwar (2018) Using intra-day data that is very unusual in developing markets, industry microstructure literature for emerging markets is used. In addition, on the Indian financial market, this paper extends the small but increasing literature. Popular factor methods were used in this article, which were rarely used in previous literature. In addition, this paper has shown the annual time-varying price discovery steps using recent data that may offer fresh insights into the mechanism of price discovery in the Indian stock market. Finally, this paper analyses the price discovery process in the Indian stock market with one-minute values for the longest study period of four years and eight months. As the futures market has been the leading spot market for the whole time, the theory of liquidity and settlement costs is found to be supported in the Indian stock market. The study results tell us which market first represents the basic information, or which market is more efficient? Market participants or fund managers may build lucrative, successful hedging, arbitrage, or speculation trading strategies based on the results of spot and futures market price discovery contributions. This study may be used by policy-makers to shape market structure policies (lot size, tick size, etc.). Investors and regulators may, above all, draw inferences about relative effectiveness.

Lu-Tao Zhao et. al. (2018) The GS model is more readily influenced by market discovery variations in three types of measurement model, such as the 2009 and 2014

`

prices estimated to be higher than 1, suggesting an invalid estimate; the PT and IS methods used in the price discovery calculation have different benefits, although their findings can be combined with other, more in-depth studies. As seen in the calculations of the price discovery model, in nearly all years, price discovery is more than 80 percent. It means that there is a high degree of exploration from potential expense to spot market. In future rates, present and future knowledge concerning the price is expressed. Economic growth and the degree of price uncertainty influence price discovery. The global economic crisis in 2009 is the explanation for the low price discovery seen in 2009 and that the energy market is at its most unpredictable. The same market fluctuations in 2014, with a stable rise in the economy and an uptick in economic inflation, triggered a slight drop in price results to more than 80 percent. Therefore, as investors perform futures trading and guide investing activity, while reducing the risk of investment, more exposure should be paid to macroeconomic growth and market uncertainty.

David A. Carter et. al. (2017) To date, analysis indicates that the effect of commodity prices can impact the returns on stocks and that this exposure can be minimised by commodity hedging. In terms of whether commodity risk control brings benefit, outcomes are mixed. Finally, diverse considerations have been found to impact the strategy of corporate hedging. Both factors include variables related to funding and wages, as well as limited hedging analytical study in corporate risk management by business management has been conducted over the past 20+ years. Academic awareness is also severely lacking. In fact, it is also far from practicable for the academic finance community to have specific guidelines as to whether Mr. Topping ("hedging is a fiduciary responsibility") or Mr. Kirby ("hedging is a waste of time") are more right in their opinions. Therefore, we conclude that there are lots of resources in the risk management field to expand our expertise. There should be lots of ways to research risk management through the prism of product suppliers and consumers, owing to data constraints with regard to researching corporate risk management broadly by non-financial firms.

L.S. Sridhar et. al. (2016) Examine the facts of price detection in the movement of the silver spot market. The co-integration test shows that there is a co-integration of platinum, futures and spot prices and that there is one co-integration equation. The

`

Granger causality test suggests that there is no bi-causal link between spot prices and futures. The cause and effect relationship however does not indicate the future and spot price. The calculations of the error correction show that spot price does not cause itself, nor does not impact potential price lags. Future price, on the other hand, does not alone affect or affect the spot price in two lags, so future Granger price affects small-level spot price. As a market finding tool for platinum, the spot price serves. Overall, the results indicate that spot price movement for potential consumer purchases should be seen as a price discovery vehicle.

Inani (2016) The research is to measure the price discovery relationship between spot and futures prices using common factor models of four Indian commodity indices, namely the combined commodity index, metal index, oil index, and agriculture index. Spot and futures markets are found to be co-integrated with both indexes and price finding takes place on the spot market.

Joshy and Ganesh (2015) The gold contract price discovery mechanism exchanged in the Indian commodity market was studied. The co-integration of Johansen demonstrates the complex relationship between spot markets and futures markets. The findings of VECM show that in the price discovery process, the spot market is dominant.

Etienne et al. (2015) Analyze whether speculative buying in index funds results in spot price bubbles for commodities. They strongly reject this hypothesis on both theoretical and observational grounds.

S.Karthikeyan (2014) Consuming fruits is recognised as a variety of advantages for the human body. An significant position gets among numerous and which is followed by banana. The processing process is one fourth of the world's overall production of bananas. India is an important country for the cultivation of bananas and for the proper use of land for refining bananas. Countries are now introducing novel approaches for the processing of bananas.

Kumar (2014) Agriculture also influences the lives of our Indian people and is a critical human task. India's agriculture sector generates about half of the national revenue. The farming industry offers workers with work opportunities. Agriculture plays a major part

`

in a country's economic growth process. Data from secondary sources of economics and statistics2011-2012 is obtained. The productivity index values are measured and the productivity regions in Trichy are separated.

Mehta, (2013) This thesis analyses the consumer behaviour and price discovery of commodity markets for Indian agriculture. Future trade in goods was allowed in 2003. A remarkable development was faced by the commodity industry. The research considered nine commodity data for the period 2009-2010 on the average monthly future price. Effective market-based approach to improve high production levels. The GDP in India is still rising. The consequence of the market discovery process analysis is that very distinct goods mean that causality can be used in spot and future price forecasting.

Srinivasan (2013) The analysis revealed the existence of a trade-off between the futures price and the underlying spot price of the commodity market and also showed that although the bi-directional spill over uncertainty persists, the spill over from spot to the futures market is dominant in all MCX commodity markets. The Yang, Bessler and Leatham (2001) study, which also suggests that the handling of goods does not influence the essence of the co-integration of cash and futures prices, but may affect the degree of bias in the estimation of cash prices, shows the same. A related analysis by Bhanumurthy on the effect of climate shocks on spot futures prices for agricultural commodities in India,

Duaand Kumawat (2012) The present thesis is an attempt to investigate the existence and direction of the Cardamom futures and spot markets price discovery process in India and to find that there is a bivariate relationship between rainfall and rice, wheat and pulse prices that demonstrates non-linearity with the systemic change that occurs after the future market entry.

Baldi et al (2013) For a long time, he analysed the long-term relationship in the centre of the spot and prospects costs for maize and soybean, which illustrates the breaks associate with occasions that have profoundly affected the availability and desire of maize and soybeans for reasons of nutrition and vitality. Despite what could be predicted, Harper et al (2011) analysed the silver value unpredictability, which indicates that both positive and negative stuns do not have an enormous effect on instability in

`

the silver spot market sector, and furthermore found that instability after some period is not reliable. The findings suggest that both positive and poor news had little major effects on silver price volatility.

Zheng, Xu et al (2012) In the latest exchange system using standard OLS and blunder rectification models, the short and long-term value mix was inspected in light of details from 2003 to 2010. The result showed that the Chinese non-GMO soyabean fates market sector is efficient in the light of knowledge, prospects costs respond adequately to exogenous value stuns, and that after these prospects costs, money costs pass.

Figuerola-Ferretti and Gonzalo (2010) A model of the relationship between spot prices and potential prices over the long term. They consider a representation of bivariate error correction based on market equilibrium that allows them to capture backwardation and contango cases, as well as detect which price is dominant in the price discovery process. They find that most of the metals they are researching are backward in higher liquid futures markets and futures rates are data dominant. They studied monthly results for spot and future prices for a fixed number of months for shipment (15-monthforward). They also demonstrate that their approach incorporates two conventional methodologies formed on the basis of micro-structure models: the Information Shares (Hasbrouck, 1995) and the Permanent-Transitory Decomposition Models (Gonzalo and Granger, 1995), which were also contrasted in De Jong (2002). They include the Garbade and Silver (1983) simultaneous dynamic model with a co-integration system, while Stein theoretically demonstrates the simultaneous simultaneous model determination of both prices (1961).

Chen et al. (2010) They find that a limited number of exporters' floating exchange rates (caused by Granger) have been useful in predicting world primary product prices, both in sample and out-of-sample terms. The reverse relation, on the other hand, does not hold out-of-sample.

Pradhan Chandra Kailash, & Bhat Sham K. (2009), by applying the Vector Error Correction Formula on regular closing prices of the S&P CNX Nifty index futures and spot Nifty index for close month futures contracts from June 12, 2000 to November 28, 2007, analysed price discovery in Nifty Futures Market concluded that the spot market

`

leads the futures market and the spot market operates as the main price discovery market.

Nath Golaka C and Lingareddy T (2008) During 2005 to 2007, the effect of future trade on agricultural commodity prices was analysed and, on the basis of the Linear Regression and Granger Causality Test, it was concluded that the rise in spot prices during the future trading cycle was important in the case of urad, as it was not relevant in the case of grammes.

Gupta Kapil and Singh Balwinder (2007) By applying Granger Causality and Vector Auto Regression (VAR) to the regular closing values of the near-month index and stock futures of Nifty futures from 12 June 2000 to 30 June 2006, the conclusion was drawn that the futures market is leading the cash market.

Ferretti, Figuerola, Isabel, & Gonzalo, Jesus (2006) In their research on LME aluminium, copper, nickel, lead and zinc exchanged commodities by applying econometric data techniques, they concluded that in the case of aluminium, copper, nickel and zinc, futures prices are the most effective to represent the equilibrium of supply and demand, while lead spot prices are the major contributors.

Chopra and Bessler (2005) The price discovery of the black pepper market for the period from October 2001 to February 2003 was analysed using the cointegration and error correction process technique. The knowledge was categorised as location, nearest futures and first far-flung futures. The findings strongly show that the centre of price discovery is the futures markets. They concluded that spot and first distant futures contracts do not respond to shocks in the cointegrating space; only long-term shock-adjusted nearby futures contracts.

Chinn et al analysed the relationship between spot and futures prices for energy supplies (crude oil, diesel, heating oil and natural gas) (2005). The key motive was to investigate whether potential markets for various time horizons were impartial and reliable predictors of subsequent spot prices. The study concluded that futures prices were impartial predictors of the prices of crude oil, petrol and heating oil, but not of the prices of natural gas among the three Horizon Months. Yet futures contracts usually justify only a limited percentage of the volatility in the fluctuations in commodity prices

underlying them. Similarly, the relationship between the spot and future prices of WTI crude oil using regular data was investigated by Silvapulle and Moosa (1999). The linear causality test showed that future prices correspond to spot prices, but the bi-directional effect was revealed by the non-linear causality test. These findings indicate that both spot and futures markets respond to data simultaneously.

Kumar and Sunil (2004) The market discovery was investigated at six Indian commodity markets for five commodities. Econometric analysis was carried out using daily futures and equivalent ready market details for three contracts, each for five sample commodities (castor seed, gur, cotton, pepper and groundnut). The information was derived from primary as well as secondary sources. The primary data was based on a June 2003 visit to two exchanges in Hapur and Muzaffarnagar. Data related to other exchanges were collected from separate exchange publications and from the Forward Markets Commission. The research used the system of Ordinary Least Squares (OLS) to approximate regression coefficients. The serial correlation problem was diagnosed using the iterative technique of Durbin-Watson and Cochrane-Orcutt. Using the Augmented Dickey-Fuller (ADF) test to check for stationary data, the unit root test was performed and the co-integration test was performed using the Augmented Dickey-Fuller (ADF) test to analyse the co-integration of spot and futures prices to check the efficacy of futures markets. The ADF test showed that the first difference was the integration of the results. The effect of the cointegration revealed that certain variables are cointegrated and not cointegrated with others. The findings showed that the futures market was unable to completely integrate details and suggested that the futures market was inefficient.

Kenourgios (2004) Price discovery was analysed using cointegration and error correction methods in the Athens derivatives exchange for the FTSE/ASE-20 futures market. For the period from August 1999 to June 2002, specifics were considered for the three-month futures contracts. The results show the emergence of bidirectional causality between the spot index and the futures index markets. The empirical findings show that futures contracts that can be used as price discovery vehicles are provided by the ADEX market and indicate an important position for prospective markets to play in their overall maturity, liquidity and secure activity.

`

Fortenbery and Zapata (1997) analysed the long-term equilibrium relationship in terms of price discovery between the cash and futures market for cheddar cheese. For the period June 1993 to July 1995, the analysis of price trends in the cash and futures markets for cheddar cheese was performed. Data for coffee, sugar and cocoa were obtained from the New York merchant exchange for futures prices and the NCE, for spot prices in Green Bay. They found no proof of a healthy long term relationship between cash and futures markets for cheddar cheese based on cointegration studies.

Yang et al (2001) Different outcomes were noticed during the discussion of the application of the cointegration methodology to the performance of futures markets for storable and non-storable goods in price discovery. For the period from 1 January 1992 to June 1998, the data for storable commodities (corn, oat, soya, wheat, cotton and pork bellies) and non-storable commodities (hogs, live cattle, feeder cattle) were in cash and near future prices. The three-month Treasury bill pace was also considered. The results revealed that the existence of a long-term relationship between cash and futures prices and the share of futures markets does not impair asset storability and provides cash markets with certain long-term price information. They also concluded that futures markets were not unbiased estimates for cash prices for two out of three non-storable commodities.

2.2. VOLATILITY OF INDEX FUTURES MARKET

The instability of the stock futures market has been analysed from numerous angles by a number of scholars. Despite researchers' dispute about the sort of impact that the derivatives sector has on the underlying market, most conclude that it is positive regardless though the uncertainty rises or decreases since the market for derivatives serves as a catalyst for the distribution of knowledge.

Mallikarjunappa and Afsal (2007) The volatility effects of the launch of derivatives on the Indian stock market using the S&P CNX IT index were analysed and it was observed that the volatility of the market increased to different degrees before and after derivatives and futures listings through clustering and persistence of volatility.

`

Gannon (2010) It develops simultaneous models of volatility that enable volatility and volume of trade effects to be simultaneous and unidirectional. To test these impacts, intraday data is used from the Australian cash index and index futures markets.

The spillover effects of overnight volatility was checked with S and P 500 index data using alternate estimates of US volatility. The simultaneous model of volatility is considered to be stable for alternative specifications of return equations and for mis-specifying the course of causality of volatility.

2.3. CAUSALITY BETWEEN STOCK INDEX AND INDEX FUTURES MARKET

Athanasios (2010) The dynamic relationship between the FTSE/ASE-20 spot market index, the FTSE/ASE-20 futures price index, and their volatility has been examined. The empirical results offer strong evidence that both feedback and at the same time discern the dynamic relationship between the expected trading operation and the volatility of the underlying market.

Debasish (2011) A new paper explores the long-term relationship between spot markets and potential prices. The analysis found that each of the chosen firms has a single long-term partnership across the six industries.

Theissen (2011) It revisited the topic of price discovery in spot and futures markets. He used a threshold error correction model to allow arbitrage opportunities to have an effect on the return dynamics. It has been observed that the futures market leads in the process of price discovery.

2.4. EFFICIENCY OF INDEX FUTURES MARKET

The process of financial liberalisation in developing countries has contributed to an increasing flow of funds from developed countries. The dramatic advances in the field of IT have led to the ultimate integration between emerging economies and developed markets. The Indian markets are no exception to this trend. Because of liberalisation, India is drawing not only foreign direct investment, but also foreign portfolio investment. Financial futures contracts are key instruments in fund management, since

`

they allow for risk transfer. In addition, derivative markets play an important part in the mechanism of price discovery of the underlying properties. Stock index futures have relatively lower exchange costs and capital requirements, but when buyers' opinions are changed, the arrival of external knowledge is quickly incorporated into stocks. Therefore, the stock index futures markets have seen a large spike in trading activity since the introduction of futures on the indices.

In the sense of the above information, it plays a crucial role not just in the productive discovery of prices but also in the creation of bubbles (lack of information flow). The role of bubbles in financial markets is intricately related to the issue of information quality. The reason is both that bubbles above and below fundamental values are a violation of business success, and that with respect to an information productivity framework in a sector, it is only possible to define the fundamental value itself and deviations from it (cp. Roll's critique in Roll, 1977). This segment starts with a short introduction to the issue of corporate success and addresses efficacy briefly due to this observation of Stock market after the introduction of index futures.

For the past 40 years, the issue of business performance has been researched intensively. "In 1970, Eugene Fama consolidated the core concept of market efficiency in his "Effective Capital Markets: A Study of Philosophy and Analytical Work". Fama described a successful market as "available information," in order to characterise the "a market in which prices always 'fully reflect' available information," and proposed classifications of weak-type, semi-strong form, and strong-form market results. These three definitions have now become the standard for interpretations of consumer efficacy.

2.5. CAPITAL MARKET OF INDIA

Since the mid-1980s, a wide variety of studies have been undertaken in India relating to financial sector reforms in general and stock market reforms in particular. This segment highlights several notable studies important to the context. Several reports, such as Sahni (1985), Kothari (1986), Mookerjee (1988), Lal (1990), Chandra (1990), Franscis (1991), Ramesh Gupta (1991,1992), Raghunathan (1991), Varma (1991), Gupta (1992), and Sinha (1993), comment on the Indian capital market in general and stock exchange trading mechanisms in particular, implying that the systems therein are

`

very antiquated and inefficient and profit from them. According to most of these reports, if the stock exchanges are to be geared towards the projected growth in the Indian capital market, substantial reforms are required.

Barua et al (1994) A detailed evaluation of the private corporate debt market, of the bond market of the public sector, of the economy. India's securities market, mortgage financing markets and other debt markets. This offers a diagnostic analysis of the condition of the Indian debt market and suggests the steps required to improve the secondary debt market. It emphasises the need to align the managed debt market with the open debt market, the need for borrowing and hedging instruments and interest rate futures to be market-based, and tax reforms.

Naresh, G., (2006), Dynamic trends in demand for derivatives, especially Futures & Options, have been analysed and possible risks to the financial system continue to encourage discourse on the proper management of these instruments. Although this sector was initially fuelled by numerous expert team polling, legal framework, bylaws and guidance, new legislation is still being debated, such as why is regulation necessary? When should legislation be needed and where? What are the sensible and achievable goals of these laws? Therefore, this article critically discusses market participants' views on potential regulatory issues in the Indian stock market in the trading in derivative securities.

The advent and expansion of the derivative instruments market is due to the ability of risk-averse economic actors to shield themselves from risks resulting from asset price volatility. By offering a broader range of risk management and capital raising instruments to investors and issuers, derivatives boost credit distribution and risk sharing in the financial economy, reduce the cost of capital formation and promote economic growth. Now that world exchange and finance markets have become more interconnected, these essential ties between global markets have been reinforced by derivatives, growing market liquidity and performance, and facilitating the flow of trade and finance.

Since 1970, financial derivatives gained popularity after the increasing uncertainty in the financial markets. The financial derivatives industry has expanded in recent years in terms of the number of available instruments, as well as their complexity and

turnover. By developing creative ways to understand, calculate, and handle risks, financial derivatives have transformed the world of finance.

As a regulated economy, India began and eventually progressed into a world where prices fluctuate every day. In this sense, derivatives can provide clients with a wide variety of advantages as tools of risk control. Therefore, allowing derivative trading is important not only to draw more investment from domestic sources, but also from offshore sources. In this regard, the process of liberalisation has contributed to the growth of India's derivatives industry.

Buguk et al. (2003) The instability in the main input market of soybean and maize spillovers to the fed and fed catfish markets has been investigated to an extent. In the U.S. catfish supply chain, market volatility spillovers were analysed based on monthly price details for catfish produce, its products, and farm and wholesale catfish from 1980 to 2000. In order to establish baseline pricing behaviour, the first variance in each market is independently analysed. Contemporary volatility is then used to analyse the spillover of volatility as exogenous factors. To assess univariate volatility spillovers for prices in the supply chain, the Exponential Generalised Autoregressive Conditional Heteroskedasticity (EGARCH) model was used. Strong price volatility spillover from feeding material (corn, soybeans, and menhaden) catfish was detected.

Kumar and Sunil (2004) The market discovery was investigated at six Indian commodity markets for five commodities. Econometric analysis was carried out using daily futures and equivalent ready market details for three contracts, each for five sample commodities (castor seed, gur, cotton, pepper and groundnut). The information was derived from primary as well as secondary sources. The primary data was based on a June 2003 visit to two exchanges in Hapur and Muzaffarnagar. Data related to other exchanges were collected from separate exchange publications and from the Forward Markets Commission.

The study used the methodology of Ordinary Least Squares (OLS) to approximate regression coefficients. The serial correlation problem was diagnosed using the iterative technique of Durbin-Watson and Cochrane-Orcutt. The unit root test was conducted to scan for stationary data using the Augmented Dickey-Fuller (ADF) test and the co-integration test was performed using the Augmented Dickey-Fuller (ADF) test.

`

Dickey-Fuller (ADF) test to analyse spot and futures co-integration rates to validate the efficacy of futures markets. The ADF test showed that the first difference was the integration of the results. The effect of the cointegration revealed that certain variables are cointegrated and not cointegrated with others. The findings showed that the futures market was unable to completely integrate details and suggested that the futures market was inefficient. The authors concluded that futures markets for Indian agricultural commodities are not yet mature and effective.

TABLE 4: SUMMARY OF RESEARCH ABOUT THE LEAD-LAG EFFECT IN DIFFERENT INDEX

Author(s)	Year	Index	Frequency	Lead from Future to Spot	Lead from Spot to Future
Kawaller 1987	1984-1985	S&P 500	1 min	20-45 min	1 min
Stoll et al. 1990	1982-1987	S&P 500	5 min	5-10 min	--
Chan 1995	1984-1987	S&P 500	5 min	10-15 min	--
Abhayankar 1995	1986-1990	FTSE 100	1,15,60 min	45 min	--
Najand et al. 1999	1996	KOSPI 200	10 min	30 min	10 min
Jiang et al. 2001	1993-1996	HIS	3,5 min	15 min	--
Manniar 2007	2004-2005	NSE	5 min	10-15 min	--
Sharma, 2008	2002-2005	NIFTY	5 min	15 min	--
Sakellariou, 2008	2000-2003	DAX	1 min	6 min	1-2 min
Tse and Chan, 2009	2004	S&P 500	3 min	15 min	3-7 min
Choudgary and Bajaj, 2012	2010-2011	NIFTY	5 min	10-15 min	--
Afonso et al. 2015	2013-2014	DAX	10 min	20-30 min	1-3 min
Polanco-Martínez and Abadie 2016	2014-2015	FTSE	1,5 min	30-45 min	2-5 min
Zavadska et al. 2018	2016-2017	SGX NIFTY	5,10 mi	10-15 min	

`

2.6. STATEMENT OF PROBLEM

The effect of commodity futures pricing on physical market prices is one of the controversial concerns among analysts and policy markers affiliated with commodity markets. Futures must be closely linked to physical commodity values and can also act as a hedging mechanism. Futures markets must serve as a "reference price" for the physical market participants. In other words, this guide price is known as the method of "Price Discovery." Commodity exchanges: The task of MCX and NCDEX is to add market productivity to the twin functions. It is important to examine price discovery and risk control processes by understanding the price determination process.

2.7. RESEARCH GAP

There is no doubt that the examined literature has shed some useful light on the different strategies emerging in the commodity markets of the world. In particular, national-level markets have achieved widespread admiration and appreciation. They will, however, climb to larger heights. The examined literature does not set out the policies and remedial steps needed to carry the markets to new heights on all fronts, including the regulatory front. The literature analysed for this reason suffers from a void. It is this void which this research aims to fill.

2.8. OBJECTIVE OF THE STUDY

1. Identify the factors that can lead to efficient and transparent price discovery.
2. Examine how the commodity exchanges have benefitted the various stakeholders.
3. To measure relative contribution of spot and future market in the price MCX and their respective individual future.
4. To investigate whether size and sector of the firm affect price discovery process.
5. To test the weak form market efficiency of Crude oil and Gold traded on MCX by using OLS regression and econometrics tools like co-integration, VAR, VECM, and Wald test.

`

6. To Prove if speculation in the future markets has a significant impact on the unexpected movement of the spot prices of Crude oil and Gold.

2.9. SIGNIFICANCE OF STUDY

New commodity futures markets have demonstrated low market depth, limited sizes, underdeveloped spot markets, regulatory limits, high taxes on commodity trading (commodity transaction tax), weak logistics mechanisms and market imperfections in many developing countries, such as India. In order to further stabilise markets and enforce other regulation measures, an effective economy benefits the government. It provides traders and suppliers of goods with accurate forecasts of potential spot prices. Therefore, the price market efficacy and unbiasedness of the respective goods in Indian commodity exchanges need to be empirically studied.

2.10. ECONOMIC RATIONALE FOR THE FUTURE MARKET

In the spot market, commodity futures markets play an important part in focusing on inventory decisions. The futures market is the hub for gathering and disseminating information on agents' preferences for potential spot prices.

Thus, the trading of commodity futures performs price discovery functions that enable spot market participants to make reasonable decisions about inventory management. This results in the uncertainty of spot markets being decreased. The expected spot prices for a future date as defined by future commodity trading on the basis of information gathered by stakeholders will result in several benefits for discretionary decision-making and allocation of resources, such as: price discovery calculated on the basis of predicted, current and future, supply and demand in this competitive market.

However, efficiency of price discovery depends on the continuous flow of information and transparency. (UNCTAD, 2007).

i. In future business guides, price discovery generates decision-making on the timing of trade and farmers in making cropping decisions, etc. Overall price discovery eliminates the so-called "cobweb effect" of price volatility between seasons.

`

ii. Future risk mitigation markets help market actors such as producers, retailers, processors, etc. to hedge their risk from price fluctuations by providing future commodity trading. Price exploration of prospective markets that encourages the stability of product prices will theoretically mitigate gains or price uncertainties by hedging (Morgan 2000).Hedging can bring greater certainty over the planning cycle, confidence to invest, adjust cropping patterns, diversity risk profile and opt for higher-risk but higher revenue crops.

iii. Risk sharing in future product markets facilitates risk sharing between different market actors. Thus, by offering a tool for risk control and price exploration, the overall future demand promotes more effective output preparation, storage, marketing and improved margins for manufacturers (Gilbert 1985, Varangis & Larson 1996, Morgan 1999, World Bank 1999).

2.11. SCOPE OF STUDY

In terms of price creation of commodities such as crude oil and gold, this thesis is limited to the examination of the potential demand efficiency of the MCX in India. Only the poor form of market productivity is being investigated. This research does not take into account problems relevant to organisational performance, such as warehousing, employer-employee partnership, the management aspect. There is also an attempt to assess the effect of speculation on the spot prices of the corresponding commodities. On the basis of mathematical tools, the influence of speculation is judged. The analysis does not provide any qualitative details related to the regular spot prices and futures contract prices for the sample commodities over various periods. Data were obtained from the official MCX website. For the analysis, the data duration ranges across commodities. The research period, however, includes the available data from the year 2009 to 2019.

Chapter III

Research Methodology

`

CHAPTER III- RESEARCH METHODOLOGY

3.1. INTRODUCTION

The approach is the technique of finding secret solutions to the teasing examination that begins the exploration and is a vital part of every analysis along these lines. The analysis technique selected allows the reliability and conjecture of the findings to be strengthened. It should be practical, successful and flexible. By using the appropriate data collection methods, this parity must be acquired. This chapter presents the approach of research to address the gaps identified in the preceding chapter. The chapter discusses the purpose and goals of the study and introduces various tests to guide the study to achieve the purpose and objectives of the study.

The methodology of research is a vital tool in determining the course of research. The methodology used is mainly based on a sound premise that gives the research a lot of credibility. Its function is primarily to validate the entire research, particularly in the case of applied research in social sciences, where all future research works are also subject to study groundwork. The area of finance is wide and continues to grow and change day by day, so only the current researchers will be substantiated by an appropriate research method, but it will also provide significant guidance for all future research studies.

In this chapter, the researcher deals primarily with the practical methodology of research used to complete the study. This methodology included several elements, such as methods of study, data set, etc.

3.2. RESEARCH DESIGN

This was causative research on the relationship between spot commodities and prices for futures. This was an empirical study of the spot prices and futures of different commodities. Therefore, its approach draws heavily from quantitative methods, being a study on the weak form of efficiency in the commodity market.

`

Causal research as an investigation of a problem that examines the effect of one thing or another.

To explain the patterns of relationships between variables, causal studies concentrate on an analysis of a situation or a specific problem. In studies with causal research design, experiments are the most common primary data collection techniques.

Only if specific causal evidence exists can the presence of cause-and-effect relationships be confirmed. There are three significant components to causal evidence:

1. **Temporal sequence**. Prior to the effect, the cause must occur. For instance, if the increase had started before the rebranding, it would not be appropriate to credit the rise in sales to rebranding efforts.

2. **Concomitant variation**. Between the two variables, the variation must be systematic. For example, if a company does not change its training and development practises for employees, then changes in customer satisfaction can not be caused by training and development for employees.

3. **Nonspurious association**. Any variation between a cause and an effect must be true, not just because of another variable. In other words, a 'third' factor that refers to both cause and effect should not be present.

Because of its attempt to reveal a cause and effect relationship between two variables, causal research falls under the category of conclusive research. This type of research tries, like descriptive research, to prove an idea put forward by an individual or organisation. It differs, however, significantly in both its methods and its purpose. Where descriptive research is broad in scope, causal research tries to better define any opinion, attitude, or behaviour held by a specific group,

Knowing which factors are the cause, and which factors are the effect. Let's say a city council, for instance, wanted to reduce car accidents on its streets. They may find that both accidents and road rage have been steadily increasing over the past 5 years through preliminary descriptive and exploratory research. It would be important to measure whether the opposite could be true, instead of automatically assuming that road rage is the cause of these accidents. In light of more accidents due to lane closures and

`

increased traffic, road rage may increase. It could also be the case of 'correlation does not guarantee causation' from the old adage. Perhaps both are increasing because of another reason like construction, lack of proper traffic controls, or an invasion of new drivers.

Determining the essence of the relationship between the causal factors and the expected outcome. Let's say the city council proved, continuing with our example, that road rage had a growing influence on the number of car accidents in the area. Causal analysis can be used for two reasons. Next, calculate the meaning of the effect, such as quantifying the percentage rise in injuries that can be caused by road rage. Second, to see how the correlation between the variables functions (ie: enraged drivers are prone to accelerating dangerously or taking more risks, resulting in more accidents).

These priorities are what makes causal analysis more scientific than its predecessors, both exploratory and descriptive. Causal researchers must isolate the main variable they assume is responsible for something occurring in order to accomplish these aims, and calculate its true importance. An company can confidently determine from this knowledge if it is worth the money to use a variable, such as installing improved traffic signals, or attempting to remove a variable, such as road rage.

It is important to look at causal studies as experimental research. Note, the purpose of this analysis is to show a relationship of cause and effect. With this in mind, providing specifically planned criteria and targets becomes very vital. Your conclusions will become misleading and have high levels of research bias without a complete understanding of your analysis strategy and what you are attempting to show. As a method to focus your study strategy on, consider using exploratory analysis or descriptive research.

1. When your study schedule and priorities are fleshed out, it's time to better set up your causative experiment. Here are three main criteria that you would want to tick off before you launch your causal experiment:

2. The relationship of cause and effect would be proven or disproved by the experiment. This may sound like a no-brainer, of course, but if you do not guarantee that your research strategy is specifically related to your research

target, the actual outcomes of your analysis will be as fruitless as most cereals for children (no offence Tucan Sam). Observe what your normal setting is to guarantee that your analysis can have outcomes one way or another, and then crank up the frequency or power of the causal variable.

3. You specifically distinguish the variables (causing effect) are being tested as independent and which are being tested as dependent (being effected). As mentioned in the case of road rage/car crash, it is difficult to say in certain situations which variable is dependent on the other. Because of this, it is necessary to determine who will be studied prior to the experiment. Typically, whatever you are introducing to the environment, the independent variable would be. We hypothesise, for instance, that increasing colour choices for cars would boost sales. In this case, the independent variable is the number of colour choices and our dependent variable is the level of revenue. Your next move will be to calculate the usual sell cost at the auto dealer, and then apply a larger range of colours to the car. Compare the two data sets after the latest sales figures are obtained and research the impact on sales.

4. There are no external conditions that can induce differences in the performance as well. You can't be positive that it is the variable being evaluated that is actually responsible for triggering the results we calculate without allowing for any potential variables that might influence changes in your dependent variable. Scientists have the privilege in the laboratory of being able to construct a fully neutral climate. Unfortunately, we have to live with the world we are provided for the remainder of us. So, when developing your study strategy, the most important thing to do is to guarantee that the experiment takes place in the most comparable situations possible as when you evaluated your usual performance. For starters, let's presume you're an owner of an ice cream shop and want to research the impact on sales that a clown passing out balloons in front of your store would have. Incredible concept, I know! Using your summertime revenue as your usual source of data and conducting your experiment in winter will be a terrible idea. Not only will it be freezing for a clown, but the temperature would have a huge influence on the sales of ice cream. Longitudinal research may take numerous different forms. They are generally observational, however, may also be experimental. Some of these are briefly discussed below:

`

I. Repeated cross-sectional analyses where, on each sampling occasion, sample participants are largely or entirely distinct; Prospective experiments over a span of time in which the same participants are followed. This may include:

   a) Cohort panels in which any or all persons with related exposures or results in a given population are considered over time;

   b) Representative panels where data for a random sample of a population is routinely collected;

   c) Connected panels on which data gathered for other purposes are tapped and linked to shape unique individual datasets..

II. Retrospective experiments are planned after at least some subjects have already undergone related events; data is obtained and retrospectively checked for possible exposures in the identified cohort.

In a cross-sectional analysis, the author simultaneously tests the outcomes and exposures of the subjects in the study. The participants in a cross-sectional sample are only chosen on the basis of the inclusion and exclusion parameters set for the study, unlike in case-control trials (participants selected on the basis of outcome status) or cohort studies (participants selected on the basis of exposure status). The investigator monitors the study to determine the exposure and the findings after the subjects have been identified for the study.

Causal analysis, for example, may be used in a corporate setting to measure the effects that a transition in the existing activities would have on the future production levels to aid with the business planning process.

3.3. DATA SET

The near-month futures contracts are the most liquid to measure potential price collection. Near month contract to prevent termination and expiration or rolled impact two days before expiry. In nature, data used in analysis was secondary. The research spans the 10-year period from 2009 to 2019. Data collected by the researcher in this time frame with the holidays and expiry of the deal in mind. Full observation 2486 of

`

the closing price of the contracts was taken into account. For this reason, data obtained from Bloomberg & MCX (Multi Commodity Exchange) However, due to their late arrival on trading markets, the data duration differs from commodities. The data was analysed with the aid of multiple data Tools for statistical and econometrics. The R (R studio) and MS Excel applications used in this analysis.

3.4. PRICE DISCOVERY FROM PANEL DATA MODEL

Narayan, Sharma and Thuraisamy (2014)

Panel data analysis is a statistical approach that is commonly used to analyse two-dimensional (typically cross-sectional and longitudinal) panel data in social science, epidemiology and econometrics. The data is typically obtained over time and over the same people, and over these two dimensions a regression is then carried out.

3.5. A PANEL DATA FRAMEWORK FOR PRICE DISCOVERY

In this segment, by using a panel data structure, we suggested computing price discovery in the commodity markets. Two separate but connected measures are included in this computation. Checking for panel co-integration is the first step. To move to the second stage, it is important to decide that commodity prices are co-integrated by the panel. Therefore, co-integration of the panel is a prerequisite for the estimation of a PVECM in the second step. The objective here is to extract the coefficients of the terms for correction of one-period lagged panel error (PECT). To calculate the lower bound and upper bound panel price discovery coefficients, these PECT coefficients are then used together with the covariance matrix. Essentially, we expand Hasbrouck's suggested time series price discovery method (1995). The PECT coefficients are also used to compute a second price discovery measure, effectively extending the proposal for the time series of Gonzalo and Granger (1995). Our panel proposal is very similar to the version of the price discovery model of the Blanco et al. (2005) time series. Let us now discuss in some detail these two measures.

Before we start with the estimation, three things need to be clarified. First of all, the definition of price discovery is imperative because the literature has been used in various contexts. Second, we need to be clear about the connection between the price

discovery concept and econometric models. Typically, when two markets are theoretically related, both markets will be affected by any shock (news). Consequently, if two markets (as in our case) are linked, it is perceived that the news is common to both markets. The relationship between two markets (over a historical period of time) is known as co-integration in econometric terms (long run relationship).

The question then is: which of the two markets will respond more quickly to the news? This is known as the speed of adjustment in econometric terms. This speed of adjustment appears in econometric models in the error correction model in the form of lagged one period news, which are nothing but innovations from the co-integrated model. Typically, because these error correction coefficients measure the equilibrium adjustment speed in each of the two markets, one can calculate the market in which the adjustment speed is the highest.

3.6. TIME- VARYING PRICE DISCOVERY

Avino, Lazar,andVarroto (2015)

A time-varying covariate (also called time-dependent covariate) is a concept used in statistics, especially in survival analyses. This illustrates the fact that over the whole analysis, a covariate is not always constant.

Discovery of credit spreads obtained at varying prices over time from future and derivative markets. Previous studies in this area show that changes in the price discovery mechanism are rather common. Zhu (2004), Blanco et al. (2005) and Bai and Collin-Dufresne (2011) argue that the leading spot market is the potential market for commodities. However, during the financial crisis of 2008, the price discovery on the commodities market declined dramatically, although it rose for the potential market (see Bai and Collin- Dufresne, 2011). Longstaff et al. (2003), Norden and Weber (2009) and Forte and Peña (2009) find commodities to lead the spot market by looking at returns (or product implied spreads). These time differences are also specifically documented in the above study as well as in Avino et al. (2013), which further extends the research to include derivative inferred potential demand. However, calculating and comparing price discovery steps in sub-periods of the initial survey is the method taken so far to illustrate time dependency. As the sub-periods need to be reasonably long to

`

maintain robust estimates, we suggest that this practise has minimal applicability. This limits the degree of time variance with which time variations can be reliably measured.

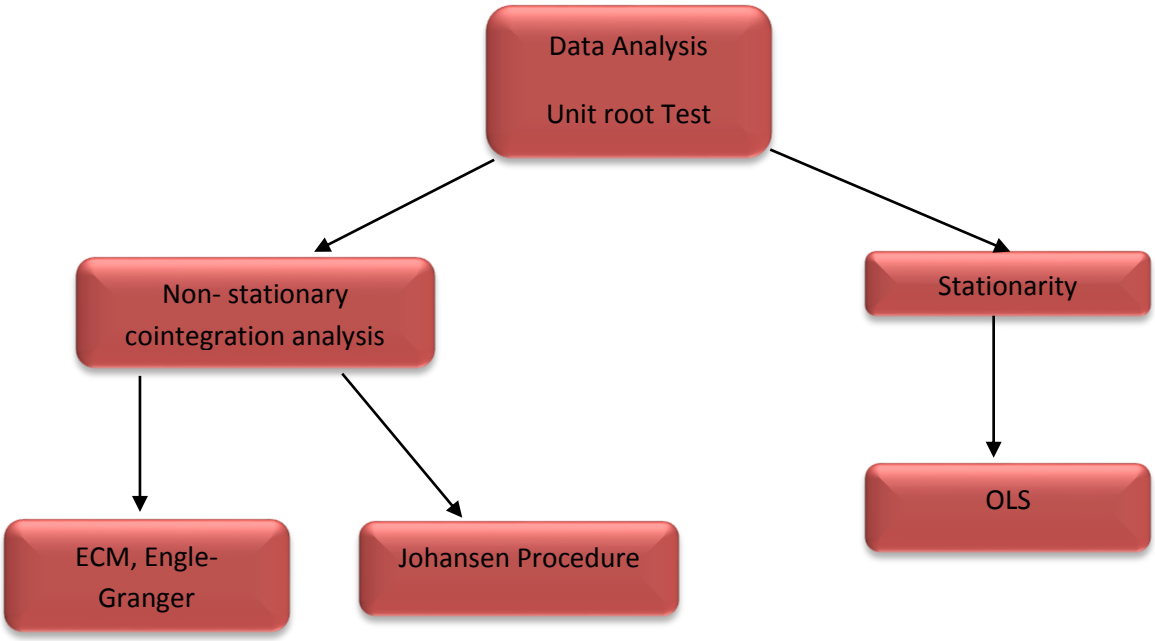
All experiments use either a VAR or VECM as the basis for quantifying the price discovery that occurs in each market with a VECM. The percentage of price discovery that occurs in each market for a given measurement period can be measured with Hasbrouck's "information share" (IS) (1995). (See Blanco et al., 2005; Forte and Peña, 2009, for example). One drawback of this method is that, during the time under review, the price results collected for each market are set. If a long-term balancing relationship occurs between the various markets, a time-varying calculation of the IS measure can be achieved by applying GARCH models to the VECM developments. We also demonstrate a clear way in which a time-varying market discovery measure can boost the forecasting ability of the VECM.

3.7. UNIT ROOT

A unit root (also referred to as a unit root process or a stationary difference process) is a stochastic trend in a time series, often referred to as a "random drift walk" if a time series has a unit root that indicates an erratic systematic pattern.

`

FIGURE 1: UNIT ROOT FRAMEWORK



A strip of wood or stone that forms the bottom of a doorway and is crossed into a space or a building. The magnitude or intensity that must be exceeded for the existence or appearance of a certain reaction, phenomenon, outcome or condition.

3.8. LAG LENGTH

The definition of the lag duration P is an important practical problem for applying the ADF test.

- If P is too small then the remaining serial correlation in the errors will bias the test.
- If P is too large then the power of the test will suffer.
- Set an upper bound P_{max} for P, estimation the ADF test regression with P= $P_{max.}$ if absolute value of the t-statistics for testing the significance of the last lagged difference is greater than 1.6 then set P= P_{max} and perform the unit root otherwise reduce the lag length by one and repeat the process.

NG & Perrorn, "Unit root test in ARMA models with data dependent methods for the selections of the truncation Lag," JASA, 1995.

`

3.9. ENGLE-GRANGER

First, the Engle-Granger technique builds residuals (error) based on static regression. The residuals are tested using ADF or a related test for the existence of a unit base. The residuals would remain essentially stationary if the time series is co-integrated. A big concern with the engle-granger approach is that the dependent variable option will lead to multiple assumptions (Aramstrong, 2001), a problem fixed by more modern experiments such as Phillips-Ouliaris and Johansen's.

H_0 – No-cointegration exits

H_1 – Co-integration exits

A more development over the Engle-Granger test is Johansen's test. If the problem of picking a dependent variable is avoided, as well as the problem produced when error is carried from one stage to the next. As such, several co-integrating vectors can be identified by the measure.

3.10. EIGEN VALUE

Let λ be a real, positive definite symmetric n*n matrix with ordered eigenvalues $0< \lambda_1 \leq \text{---} \leq \lambda_n$

for any unit vector y., we can construct another matrix in the following fusion. M is symmetric and positive semi-definite with a zero-eigenvector y. let its eigenvalues be labelled $0=\mu_1 \leq \text{------} \leq \mu_n$.

Now, since M is symmetric all other eigenvectors can not exceed the largest one of Λ, i.e. $\mu_n \leq \lambda_n$

3.11. THE CHOICE OF THRESHOLD VARIABLE

As the threshold of the threshold regression model, this analysis sets volatility, volume (number of contracts), liquidity and potential market basis and speculates that volatility is due to the movement of knowledge. Several experiments have shown that data would

`

first flow to the prospective market and then spot the market (see Kwaller et.al. 1987 & Chan 1992).

Lower liquidity in the future market, due to slower response time, shortens the knowledge communication distance between the two markets. The foundation, according to the cost-of-carry formula, would decide the interest rate and stock yield rate. If the basis is sufficiently big, which suggests that future values are comparatively higher than spot prices, arbitrageurs would have a long and short future, Variable: volatility, quantity (Contacts).

3.12. VAR MODEL, ECM MODEL, THRESHOLD MODEL

Four main models were tested by Basdas (2009) and Ritson (2001), who found that the VAR and VECM models were better models.

This research uses the VAR model and the VECM model to assess the future-spot movement relationship. In previous research (Kawaller 1987, Tse and Chan 2010), the VAR model is generally used because their relationship can be taken into account concurrently by this model.

Granger representation theorem (Engle and Granger 1987), we assume that there is not co-integration among each variable, we can stabilize series data then estimate using VAR. while there exits co-integration. It will miss the information of long-term relationship if we only stabiles series data. To solve this problem, we should use an error correction model. First, we estimate co-integration. In this stage, we can test whether two variable deviates to long term balance.

We use a threshold regression model, according to Tsay (1998), Bai & Perron (2003) and Tse & Chan (2003), to see the lead-lag effect under different market conditions and to catch different variables in a non-linear correlation. In addition, these studies also assume that the four thresholds (volatility, volume, liquidity) would have a big effect on the flow of information.

`

3.13. VAR MODEL

Vector autoregression is a statistical model used to capture the relationship of several quantities as they change over time (VAR). VAR is a sort of stochastic process model. By allowing for multivariate time series, the single-variable (univariate) autoregressive construct is generalised by VAR simulations. VAR models are also used in economics and in the natural sciences.

Each vector, like the autoregressive model, has an equation modelling its evolution over time. This equation includes the variable's lagged (past) values, the other model variables' lagged values, and an error term. VAR models do not require as many data about the forces influencing a variable, as structural models with simultaneous equations do. The only prior knowledge needed is a list of variables that can be hypothesised to affect each other over time.

A VAR model describes the evolution of a group of k variables, called endogenous variables, over time. Any span of time is numbered, t = 1,..., T. The k variables are modelled as a linear equation with only their past values. The variables are gathered in a vector, y_t, which is of length k. (This vector can also be known as a (k?? 1)-matrix.) The vector components are referred to as yi,t, i.e. at time t, the observation of the unit I^{th}.

The order of the VAR models is defined, which corresponds to the number of previous cycles that the model will use. As a linear combination of the last five years of wheat prices, a 5th-order VAR can model the wheat price of each year, continuing with the above example. A latency is the magnitude of a word within a previous time period. In general, then, a VAR p^{th}-order refers to a VAR model that for the last periods of p time includes lags. A p^{th}-order VAR is referred to as "VAR(p)" and often referred to as "a VAR with p lags." A VAR pth-order model is written as a p^{th}-order VAR model.

$$\Delta y_t = c + A_1 y_{t-1} + - - - + A_p y_{t-p} + e_t$$

`

The type vector y(t-1) shows the value/time intervals of that variable earlier and calls y t's "ith lag." Factor c is a k-vector of constants that is a time version (k x k)-matrix and e-t is a k-vector of error terms acting as the intercept of model A-i. Three conditions satisfy the error terms.

1. E (e_t) = 0 Every error has a mean of zero.
2. E ($e_t e'_t$) = Ω the contemporaneous covariance matrix of error terms is a k * k positive- semidefinite matrix denoted Ω.

3.14. ECM MODEL

The standard way to model time series equations is to use an Error Correction Model (ECM). The ECM requires nonstationary data series to be dealt with and divides the long and short term.

ECM models do not make any ad hoc assumptions about how, over time, the variables change.

Two kinds of application of the ECM:

• Two-steps ECM Engle and Granger procedure (1987, first approach in time)

One-step ECM

Consider a simple model, where y_t and x_t are both

$$y_t = \beta_1 + \beta_2 x_t + u_t$$

If there is a linear combination of y_t and x_t that is stationary (that is I (0)), then y_t and x_t are cointegrated. This implies that the estimated residuals are stationary, so that

$$\hat{u}_t = yt - \beta_1 + \beta_2 x_t$$

`

3.15. THRESHOLD MODEL

3.15.1. COMPUTATION OF VOLATILITY

The computation of volatility of a financial asset as stock prices in based on a mathematical model.

DISCRETE MODEL

In this method, the return is calculated over discrete time periods. The equation for the return value is

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$

Where,

R_t= Return at time 't'

P_t= Price at time 't'

P_{t-1}= Price at time 't-1'

Let $\bar{m}=\frac{1}{n-1}\sum_{i=1}^{n} R_i$ represent the mean return and the variance estimate yields a formula for volatility $\delta^2=\frac{1}{n-1}\sum_{i=1}^{n}(R_i - \bar{m})^2$

Thus, the volatility of the share price is the standard deviation over a given period of time from the return on the share. The square root of variance is standard deviation.

3.16. INFORMATION AND VOLATILITY

In the opinion of Black (1976a), the most significant advantage of opening a potential market is that it improves the flow of knowledge. Introducing a potential market offers market members with quotes on future stock market demand and supply.

`

In addition, the futures market often draws knowledgeable traders with its superior knowledge to make money, where the transaction costs of trading on those information are smaller. Thus, the launch of futures contracts raises the volume of freely accessible information. If index futures trading raises the available knowledge, then an increase in volatility of the underlying stock price may follow its implementation (Ross, 1989).

3.17. JARQUE-BERA STATISTICS

A goodness-to-fit test is the Jarque-Bera test. This test was used for data series normality checking. It was created and named after Carlos Jarque and Anil K. Bera. It is a form of multiplier test for lag range. This examination investigates the skewness and kurtosis coordinated with normal distribution in the other data set. Normality checks are used to determine whether a data set is well modelled by a regular distribution and to measure how likely it is to normally spread a random variable underlying the data set.

If a statistic fails a normality measure, looking at the histogram and the usual frequency map is important to see if the non-normality has been induced by an outlier or a small subset of outliers. If there are no outliers, to make the data regular, you might try a transformation (such as, the log or square root). Nonparametric approaches that do not require normality may be used where a transformation is not a feasible solution. Often note that to detect deviations from normality, a relatively large sample size is needed. For samples with fewer than fifty observations, only extreme cases of non-normality can be observed. A widespread misunderstanding remains that a histogram is often a legitimate graphical instrument for normality evaluation. Other graphical displays such as the box diagram, the trace of density, and the regular probability plot may be preferred since there are several discretionary decisions that need to be made to construct a histogram, and because histograms generally need significant sampling volumes to show an accurate picture of normality. Normality tests usually have little predictive potential since the sample sizes are at least greater than 100 (probability of non-normal data being detected).

`

$$JB = \frac{n}{6}\left(s^2 + \frac{1}{4}(K-3)^2\right)$$

Where *n* denotes the number of observations.

S denotes skewness co-efficient of data series.

K denotes kurtosis co-efficient of data series.

3.18. TESTS OF STATIONARITY

Data used in time series; the first assumption that is evaluated for in time series is stationary. The underlying sequence is stationary, as observational analysis focused on time series evidence assumes. A sequence is considered to be stationary in basic terms if its means do not differ systematically over time (Gujarati, 2007). Granger and Newbold (1986) have found out that there are non-sense or dubious findings from the use of non-stationary data. To test stationarity in data sequence, the unit root test is commonly used. There are, however, several tests available for measuring unit root in which the researcher commonly uses the Augmented Dickey-Fuller test and Phillip Perron.

Stationarity implies that, over time, the statistical properties of a time series (or rather the mechanism that produces it) do not change. Stationarity is important since it is based on many useful analytical instruments and statistical tests and models. As such, it is necessary to be capable of determining if a time series is stationary. This generally means being able to determine, with high probability, that a series is created by a stationary process, rather than choosing between two strict alternatives. It is a questionable endeavour to try to decide whether a time series was created by a stationary method only by looking at its plot. There are some simple properties of non-stationary info, however, that we can look for. Let's take as example the following nice plots from Hyndman & Athanasopoulos, 2018.

Stationarity checks are used to check whether or not a sequence is stationary. There are two separate approaches: stationary tests, such as the KPSS test, which assumes the series to be stationary as null hypothesis H0, and unit root tests, such as the Dickey-Fuller test and its augmented variant, the augmented

`

Dickey-Fuller test (ADF) or the Phillips-Perron test (PP), where the null hypothesis is that the series has a unit root and thus does not have a unit root.

By beginning with the standard, Kwiatkowski, Phillips, Schmidt and Shin (1992) derived their test.

The Augmented Dickey Fuller Unit root test is based on the premise that an autoregressive operation is accompanied by a sequence. For Dickey Fuller, the error word is believed to be uncorrelated. But if the error term is correlated, Dickey and Fuller have devised their advanced type, better known as the Enhanced Dickey Fuller test, which controls higher order correlation by adding the dependent variable's lagged values to remove the autocorrelation problem.

The ADF test uses the following regression equation

$$\Delta X_t = \alpha + \beta t_1 + \delta X_{t-1} + \sum_{j=1}^{q} \gamma_j \, \Delta X_{t-j} + \epsilon_t$$

Where 'q' is the number of lags determined and tests the hypothesis.

α is a constant and β the co-efficient on time trend

The null hypothesis of this test is

H0= Variable has a Unit root.

Ha= Variable does not have a unit root.

3.19. KWIATKOWSKI–PHILLIPS–SCHMIDT–SHIN (KPSS) TEST

The KPSS test is another popular test for the existence of a unit base. In comparison to the Dickey-Fuller test family, the null hypothesis implies stationarity around a mean or a linear pattern, whereas the presence of a unit root is the alternative. [Kwiatkowski et al, 1992].

$$x_t = r_t + \beta t + \epsilon_t$$

`

Where $r_t = r_{t-1} + u_t$

The test is based on linear regression, splitting the sequence into three components: a deterministic pattern (βt), a random walk (r t), and a stationary error (εt), with the equation of regression: and where u~(0, σ2). Thus, the null hypothesis is claimed to be H0: σ2=0 while Ha: σ2>0.0.0 is the alternative. It is calculated by setting β=0 (in which case x is stationary around the mean r0) or β ⁇ 0, respectively, if the stationarity in the null hypothesis is around a mean or a pattern.

3.20. PHILLIPS-PERRON TEST (PP TEST)

Peter C.B. Phillips and Pierre Perron in 1988 are named after this commonly used unit root test. In order to take account of the serial association of error terms rather than the inclusion of lagged difference values of error terms, the Phillips and Perron test uses non-parametric statistical techniques. For monitoring serial correlation, this test is an alternative. This test is a modification of ADF t-statistics since it allows a non-parametric correction to the t-test statistics, whereas by adding lagged differential values, the ADF test corrects for autocorrelation. The equation of regression used for this test is defined below.

$$\Delta Y_t = \beta_1 + \beta_2 t - \delta Y_{t-1} + \mu_t$$

Δ= Difference operator

μ= error

The null hypothesis of the Phillips-Perron Test is stated below:

Ho= Variable has unit root.

Ha= Variable does not have a unit root.

Chapter IV

Data Analysis & Result

CHAPTER IV- DATA ANALYSIS & RESULT

4.1. INTRODUCTION

After devising a detailed research methodology strategy and methodology to be adopted in the preceding chapter, this chapter gives the detailed analysis, discussion and the assessment of the outcomes of the research thereof shading a light into the conceptual theory which was developed after a through review of the related literature. The research objectives are met by analysing the most crucial dimensions and variables which were considered for the study through the various tests to understand the comprehensive which are responsible for enhancing the performance of the organisation in every company.

The results of stationarity test given in Table. it confirms non-stationarity of commodity price data hence we repeat stationarity tests on return series (estimated as first difference of log prices) which are also provided in Table 2. The tables describe the sample price series that have been tested using Augmented Dickey Fuller (ADF)1981. The ADF test uses existence of a unit root as the null hypothesis. To double check the robustness of the results, Phiilps and Perron (1988) test of stationarity has also been performed for the price series and then both the test is performed on return series. Panel A (Price Series) and Panel B (Return Series) report result of and commodities respectively. The sample return series exhibit stationarity thus conforming that both spot and future commodity prices are integrated to the first order.

If two or more series are themselves non-stationary, but a linear combination of them is stationary, then the series is said to be co-integrated. Given that each commodity spot and futures prices are integrated of the same order, co-integration techniques are used to determine the existence of a stable long run relationship between the price pairs. Arrival of new information results in price discovery for short intervals of time between future and spot market dure to communication cost. Increased availability and lower cost of information account together for faster assimilation of information in the futures market than a spot market (Koontz et. al. 1990). The price linkage between futures

`

market and spot market is examined using co-integration (Johansen, 1991) analysis that has several advantages.

Here we address the discovery of credit risk by generalised knowledge share (GIS) suggested by Lien and Shrestha (2014), which is free from the one-to-one presumption of cointegration. The empirical findings support GIS being a more effective indicator for the study of credit risk exploration between stock and CDS markets. The relative informational superiority becomes even less severe when GIS is used than when IS or GG is used. Nonetheless, the three tests have quantitatively consistent findings on average. In general, stock leads CDS in credit risk exploration, with the exception of the 2008-2010 timeframe. Often, to achieve the pure credit risk portion, transitory components are removed from asset values.

This exercise raises the CDS market's knowledge productivity in the earlier sample era, likely because back then the CDS market was less competitive. Another observation is that, relative to speculative-grade companies, the CDS of investment-grade firms has a higher credit risk discovery share.

In addition, this chapter proposes the financial situation index and the cost of borrowing as possible drivers of the discovery of credit risk, and both are statistically important. The findings show that the exposure of the stock market to credit risk exploration is usually higher, but when the overall economy suffers, the CDS market becomes dominant. The higher cost of borrowing adversely affects the CDS market's knowledge quality. Lastly, it is not known that the CCP will increase the effectiveness and transparency of the CDS industry. Instead, the CCP decreases the CDS market's knowledge performance, which confirms the insider trading theory raised by Acharya and Johnson (2007).

`

TABLE 5: CONDITION FOR CREDIT RISK DISCOVERY

Hypothesis	Condition for Credit Risk Discovery	Dominant Market
Trading Cost Hypothesis Low Stock	Low	Stock
Liquidity Hypothesis High Stock	High	Stock
Market Maturation Hypothesis Mature Stock	Mature	Stock
Market Trading Mechanism	Electronic Trading	Stock

Five price discovery theories related to credit risk discovery are shown in this table. The circumstances in which credit risk news is uncovered are outlined in the second column. In the third column, the predicted dominant markets are presented based on the inferences of these hypotheses. These hypotheses are not mutually exclusive, and the various effects of these hypotheses which result in the dominant position of one sector.

`

TABLE 6: SUMMARY OF PRICE DISCOVERY TECHNIQUES

Group 1	**Lead – Lag Relation based on VAR Model, using returns**							
Group 2	**Volatility Spillover based on VAR-GARCH Model, using volatilities**							
Group 3	**Price Discovery Contribution Measures based on VECM Model, using prices**							
		Provide unique result	**Depend on one-to one cointegration relation**	**Prefer high frequency data**	**Consider nonlinearity in adjustments to the long run efficient price**	**It is dynamic**	**Permit long memory in equilibrium innovations**	**Consider the panel nature of the data**
	Panel A: Price Discovery Contribution Measures Constructed in Reduced-form VECM Framework							
	Hasbrouck's (1995) Information Share	No	Yes	Yes	No	No	No	No
	Lien and Shrestha's (2009) Modified Information Share	Yes	Yes	Yes	Yes	No	No	No
	Lien and Shrestha's (2014) Generalised Information Share	Yes	No	Yes	No	No	No	No
	Grammig and Peter's (2013) New Information Share	Yes	Yes	No	No	No	No	No

`

	Gonzalo and Granger's (1995) Component Share	Yes	Yes	No	No	No	No	No
	Figuerola-Ferretti and Gonzalo's (2010) Component Share	Yes	No	No	No	No	No	No
	Panel B: Price Discovery Contribution Measures Constructed in Structural VECM framework							
	Yan and Zivot's (2010) New Information Share	Yes	Yes	Yes	No	Yes	No	No
	Gustavo (2019) Continuous Time Price discovery	Yes	Yes	No	Yes	No	No	No
	Panel C: Price Discovery Contribution Measures Constructed in Threshold VECM framework							
	Chen, Choi, and Hong's (2013) Modified Component Share	Yes	Yes	No	Yes	No	No	No
	Avino, Lazar, Varotto (2015) Information Share	Yes	Yes	Yes	Yes	No	No	No
	Panel D: Price Discovery Contribution Measures Constructed in VECM-GARCH framework							
	Avino, Lazar, Varotto (2015) Dynamic Information Share	No	Yes	Yes	No	Yes	No	No

`

	Panel E: Price Discovery Contribution Measures Constructed in Fractional VECM framework							
	Dolatabadi, Nielsen, and Xu's (2015) Modified Component Share	Yes	No	No	No	No	Yes	No
	Grammig and Peter's (2017) New Information Share	No	Yes	Yes	No	Yes	No	No
	Panel F: Price Discovery Contribution Measures Constructed in Panel VECM framework							
	Narayan, Sharma, and Thuraisamy's (2014) Panel Information Share/ Panel Component Share	No	Yes	Yes	No	No	No	Yes
	Gustavo (2019) Continuous Time Price discovery	Yes	Yes	Yes	No	No	No	Yes

Note: A description of the current methodologies for price discovery is given in this table. It is possible to divide price discovery methodologies into three categories, according to So and Tse (2004). Group 1 is a VAR framework-based lead-lag partnership. Group 2 is a spillover of uncertainty dependent on the VAR-GARCH model. Group 3 is a contribution measure based on the VECM paradigm for price discovery. The main price discovery contribution initiatives focused on various VECM structures and their characteristics are discussed in
Panel A-F of group 3.

`

TABLE 7: DESCRIPTIVE STATISTICS

	In spot	In future
Mean	**7.2604**	**7.2861**
Median	7.2574	7.2580
Maximum	7.4802	7.4803
Minimum	5.6841	5.6902
Std. Dev.	0.2654	0.2658
Skewness	-0.8341	-0.8352
Kurtosis	4.3251	4.3198
Jarque-Bera	126.7210	128.7016
Probability	0.0000	0.0000
Sum	8389.0241	8392.1203
Sum Sq. Dev.	82.2468	83.9875
Observation	2486	2486

TABLE 8: DESCRIPTIVE STATISTICS FOR CRUDE OIL

Crude Oil			
	Mean	**Median**	**SD**
Return	1.223	0.000	0.713
Skew	-0.052	-0.112	0.623
FutVol	892.65	148.42	1786.50
FutOI	2154.06	603.86	1423.84
FUTQSpr	0.019	0.019	0.031
OptVol	184.89	184.37	85.88
OptOI	2896.07	2906.78	423.43
OptQSpr	0.553	0.512	0.362

`

TABLE 9: DESCRIPTIVE STATISTICS FOR GOLD

Gold			
	Mean	Median	SD
Return	2.340	0.475	0.653
Skew	-0.684	-0.324	1.342
FutVol	640.89	18.16	943.52
FutOI	664.51	98.42	1124.96
FUTQSpr	0.126	0.094	0.132
OptVol	32.12	28.24	22.12
OptOI	987.62	1042.54	321.03
OptQSpr	1.954	1.845	4.608

Note: Between April 1, 2009 and March 31, 2019, it publishes descriptive figures of futures and options market activity for each commodity. Interest factors include regular futures returns (Return), daily futures return skewness (Skew), daily trading volume of options and futures in thousands (OptVol and FutVol), daily options and futures open interest in thousands (OptOI and FutOI) and bid-ask range of daily options and futures (OptQSpr and FutQSpr).

Table 10: STATIONARITY TEST FOR SAMPLE COMMODITIES

	Panel – A Price Series		**Panel-B Inference on Return Series Integration**	
	ADF Test	**Phillips-Perron Test**	**ADF Test**	**Phillips- Perron Test**
	t- statistics	**t- statistics**	**t- statistics**	**t- statistics**
Crude Oil				
Future Prices	-2.43	-2.47	-40.85	-40.82
Spot Prices	-2.42	-2.33	-40.63	-40.61
Gold				
Future Prices	-2.19	-2.24	-39.41	-39.26
Spot Prices	-2.12	-2.17	-39.26	-39.18

`

The sample price series checked using Augmented Dickey Fuller (ADF) 1981 are listed in the table. The lack of a unit root is used by the ADF test as the null hypothesis. Phillips and Perron (1988) stationary experiments have also been conducted on the price series to double check the robustness of the effects, and then all the tests are performed on the return series, as seen in the combined Panel-A (price series) and Panel B (return series). Both experiments are carried out using a 5% significance stage.

TABLE 11: AUGMENTED DICKEY- FULLER_KPSS

SUMMARY STATISTICS:							
VARIABLE	Observations	Obs. with missing data	Obs. without missing data	Minimum	Maximum	Mean	Std. deviation
N	2486	0	2486	-2.134	2.068	0.138	0.968
N(R=0.8)	**2486**	**0**	**2486**	**-3.163**	**2.909**	**0.621**	**1.295**

Significance level: 5%
Dickey-Fuller Test: ADF (stationary)
KPSS test: Level
Phillips-Perron test: PP (intercept)

TABLE 12: DICKEY-FULLER TEST (ADF(STATIONARY) / K: 4 / N)

Tau (τ) (Observed value)	**-4.960**
Tau (τ) (Critical value)	-0.791
p-value (one-tailed)	0.000
Alpha	0.05

Test Interpretation
Ho: there is a unit root for the series.
Ha: There is no unit root for the series. The series is stationary.
As the computed p-value is lower than the significance level=0.05, researcher reject the null hypothesis Ho and accept the alternative hypothesis Ha.

`

TABLE 13: KPSS TEST (LEVEL / LAG SHORT / N)

Eta (η) (Observed value)	**0.056**
Eta (η) (Critical value)	0.451
p-value (one-tailed)	0.872
Alpha	0.05

Test Interpretation

Ho: The series is stationary.

Ha: The series is not stationary.

As the computed p-value is greater than the significance level alpha=0.05,one can not reject the null hypothesis Ho.

TABLE 14: DICKEY-FULLER TEST (ADF(STATIONARY) / K: 4 / N(R=0.8)

Tau (τ) (Observed value)	**-3.587**
Tau (τ) (Critical value)	-0.791
p-value (one-tailed)	0.032
Alpha	0.05

Test Interpretation

Ho: There is a unit root for the series.

Ha: There is no unit root for the series. The series is stationary.

As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis Ho, accept the alternative hypothesis Ha.

`

FIGURE 2: STATISTICS SERIES

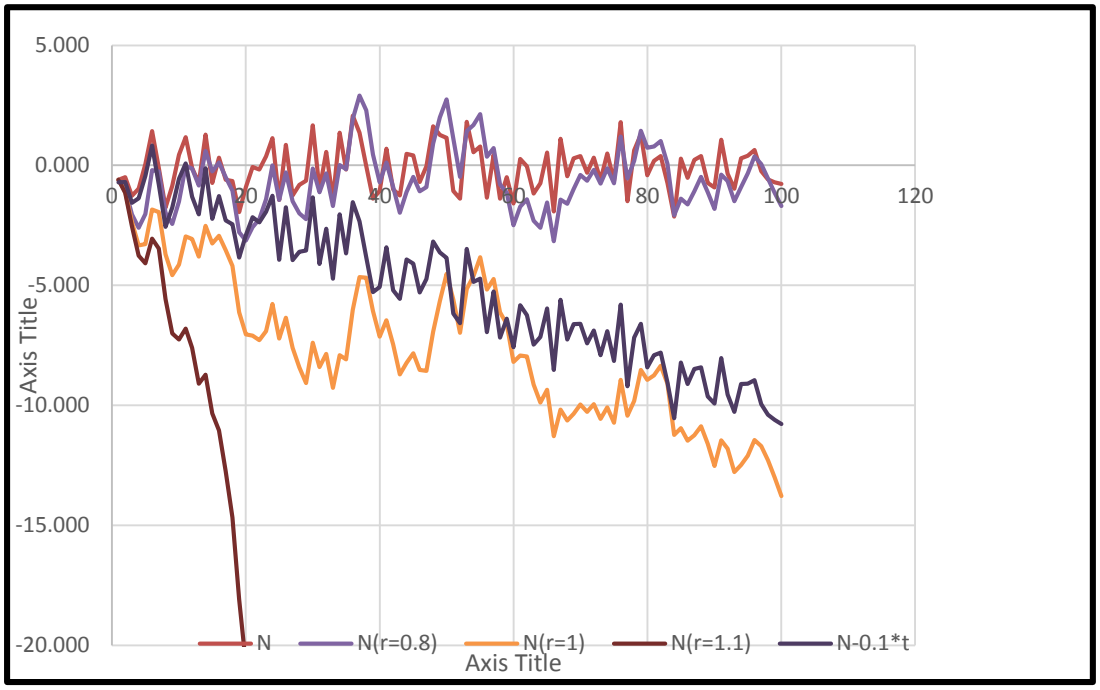


FIGURE 3: STATISTICS ERROR BARS

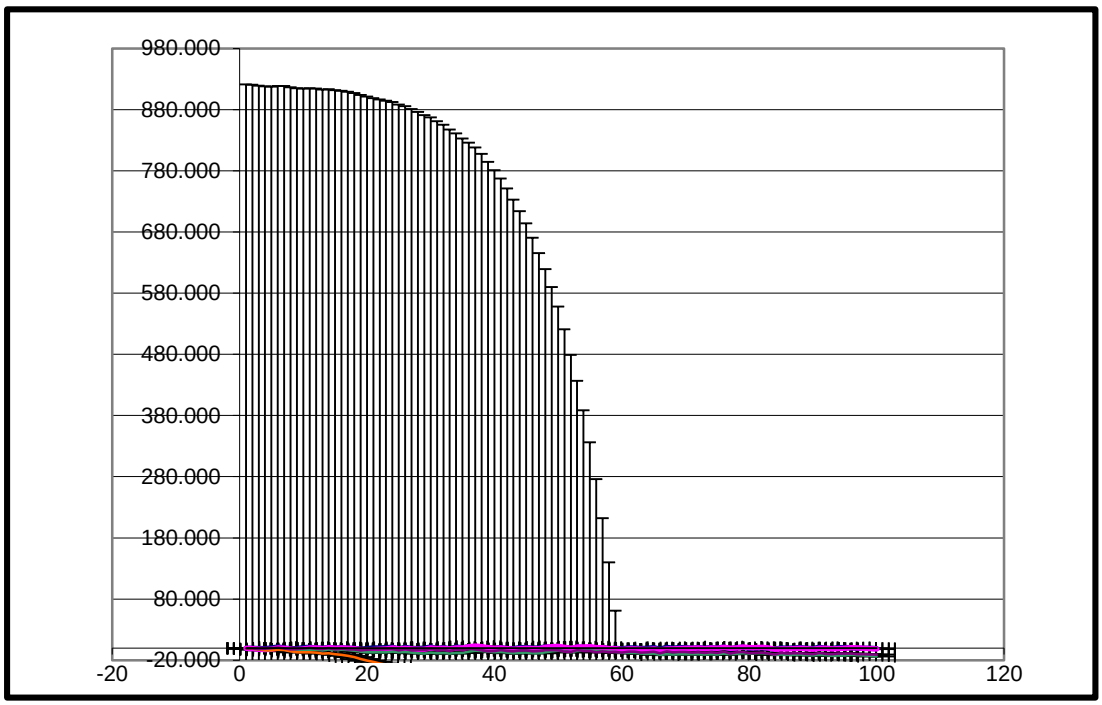


FIGURE 4: KPSS TEST PLOT AREA

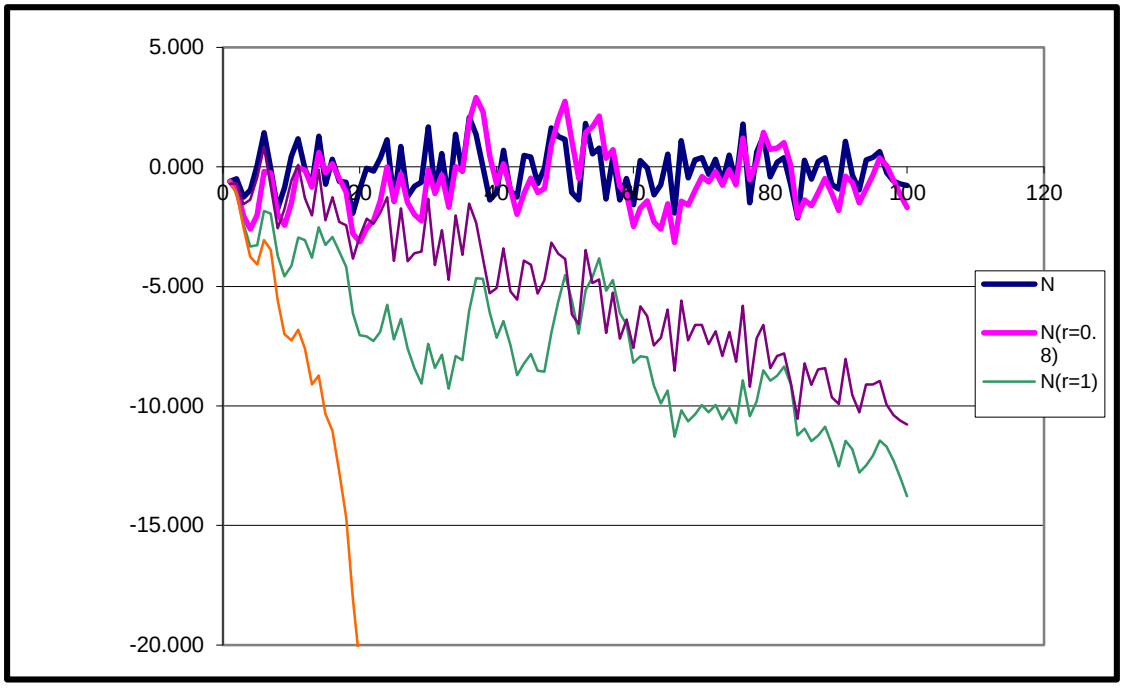


TABLE 15: PHILLIPS-PERRON TEST (PP(INTERCEPT) / LAG: SHORT / N)

Tau (τ) (Observed value)	**-10.836**
Tau (τ) (Critical value)	-2.891
p-value (one-tailed)	< 0,0001
Alpha	0.05

Test Interpretation

Ho: There is unit root for the series.

Ha: There is no unit root for the series. The series is stationary.

As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.

TABLE 16: PHILLIPS-PERRON TEST (PP(INTERCEPT) / LAG: SHORT / N(R=0.8)

Tau (τ) (Observed value)	**-4.298**
Tau (τ) (Critical value)	-2.891
p-value (one-tailed)	0.001
Alpha	0.05

`

Ho: There is unit root for the series.

Ha: There is no unit root for the series. The series is stationary.

As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.

TABLE 17: KPSS TEST (LEVEL / LAG SHORT / N(r=0.8)

Eta (η) (Observed value)	**0.186**
Eta (η) (Critical value)	0.451
p-value (one-tailed)	0.308
Alpha	0.05

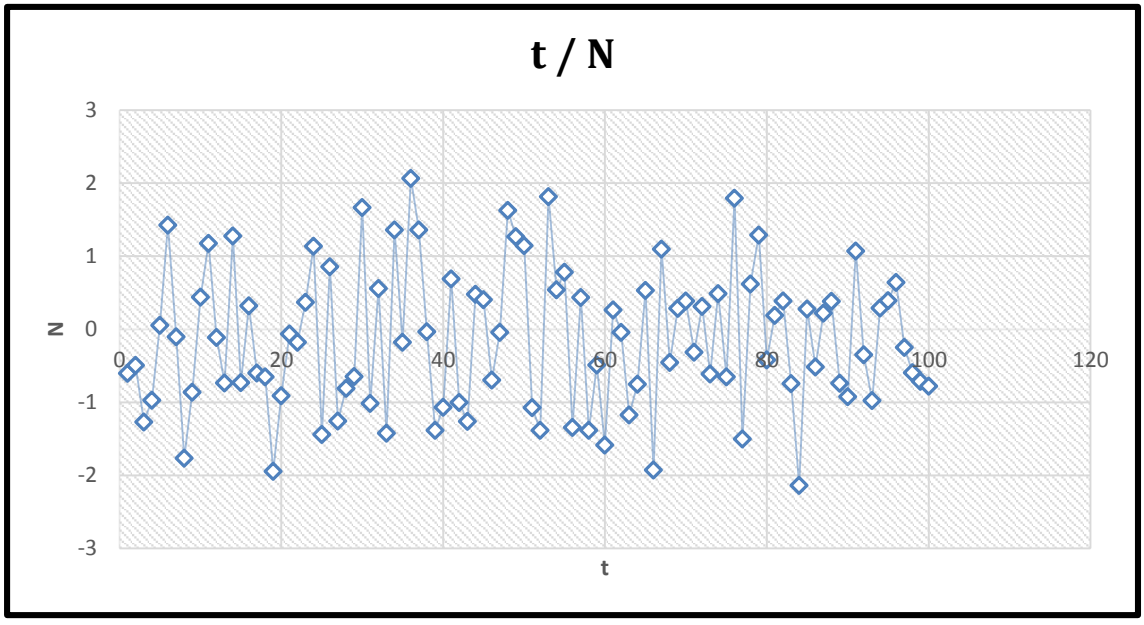
Test Interpretation

Ho: The series is stationary.

Ha: The series is not stationary.

As the computed p-value is greater than the significance level alpha =0.05, one cannot reject the null hypothesis Ho.

FIGURE 5: KPSS TEST LAG SHORT



`

FIGURE 6: ADF ERROR BARS

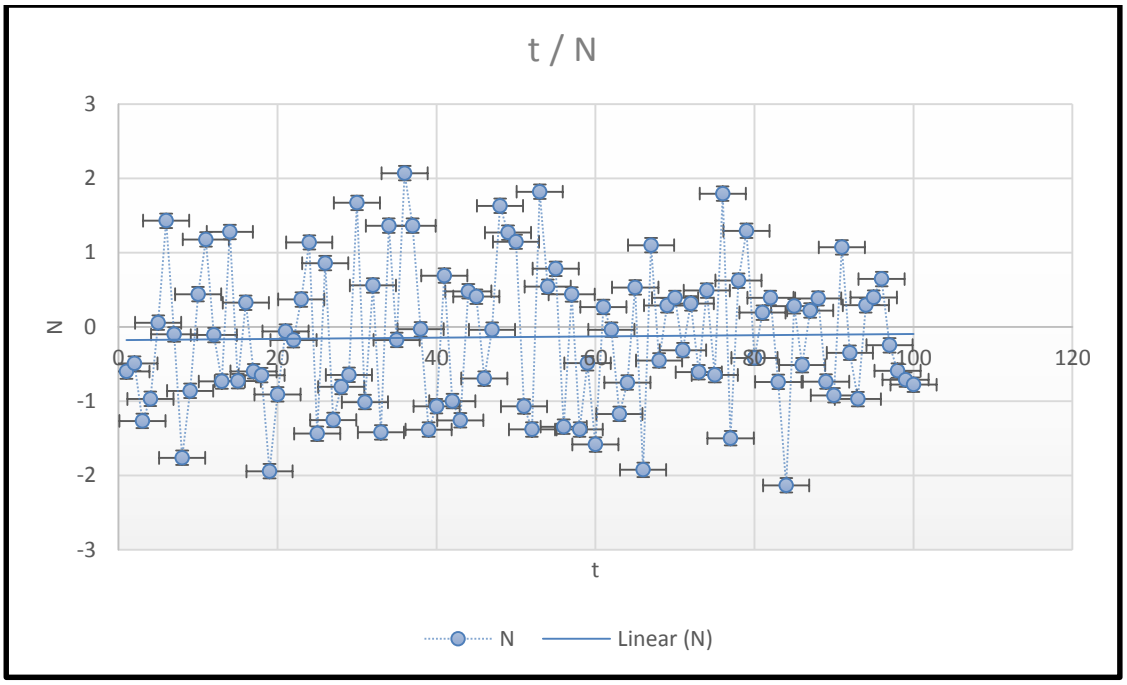
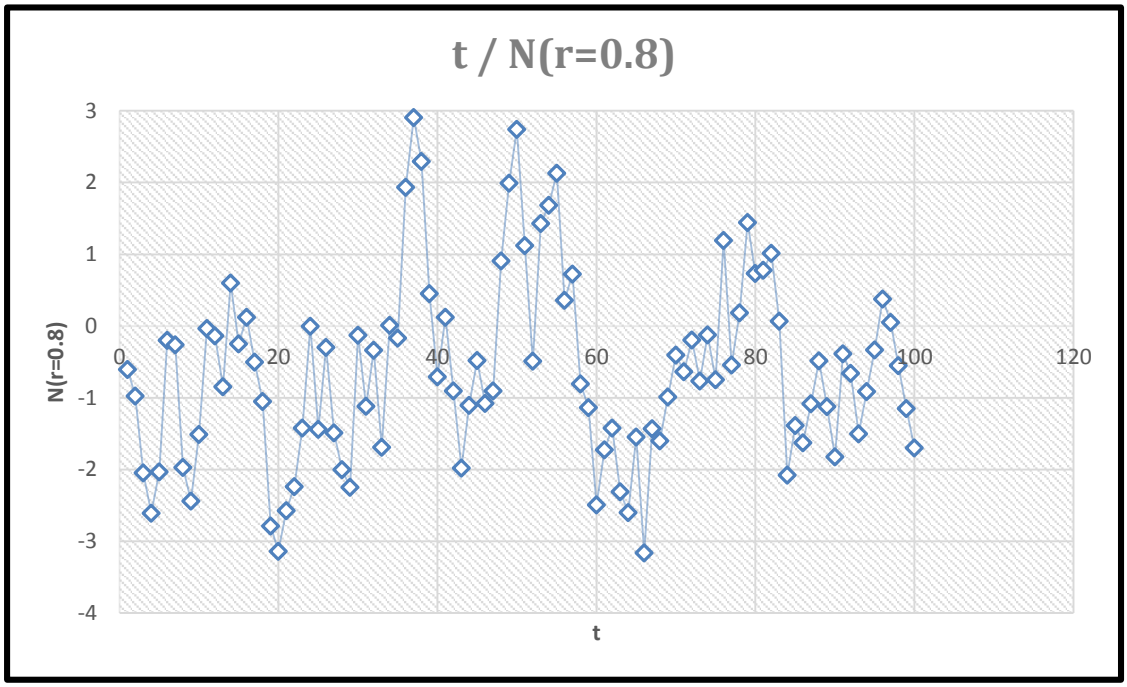


FIGURE 7: PHILLIPS-PERRON TEST



`

FIGURE 8: PHILLIPS- PERRON ERROR BARS

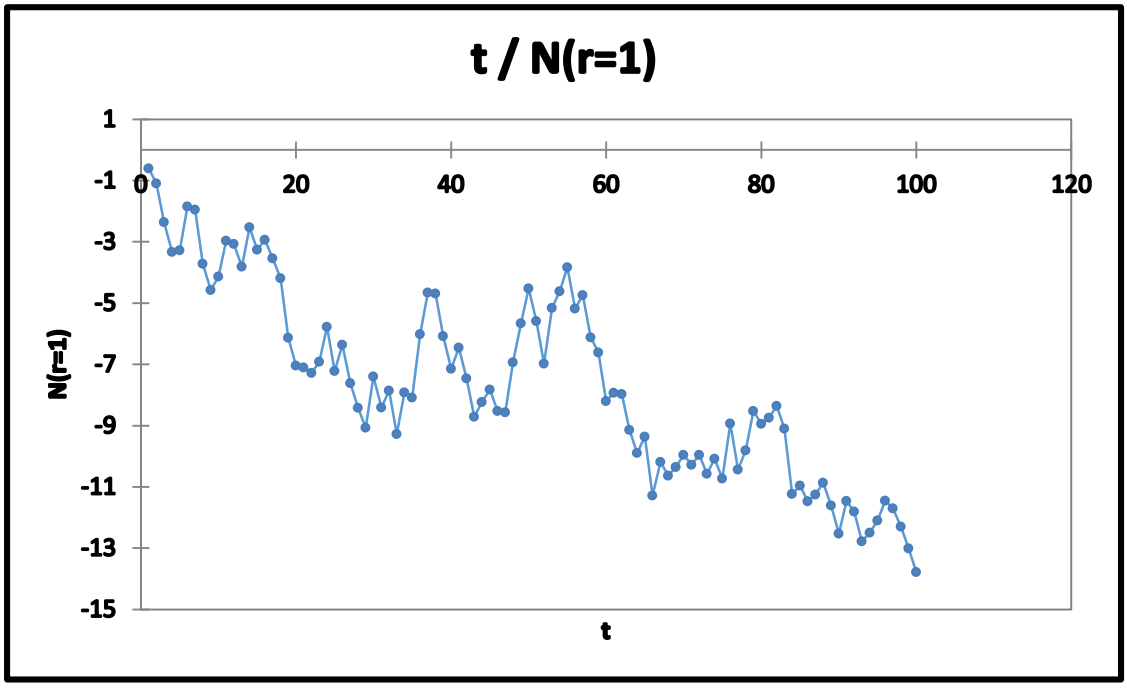
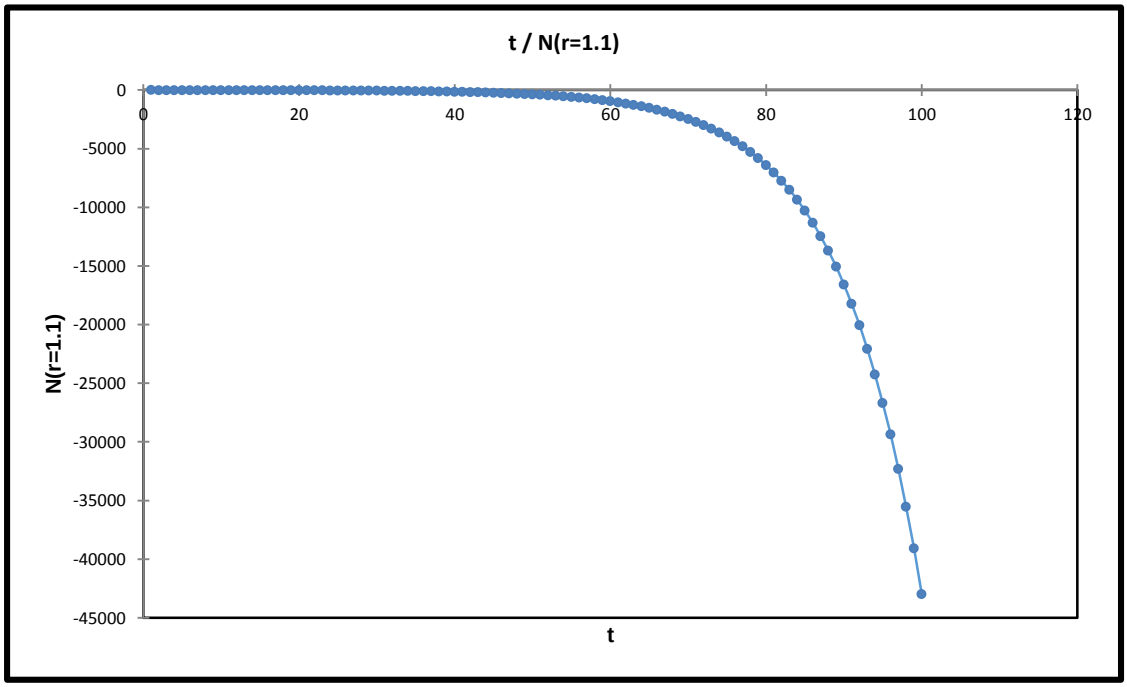
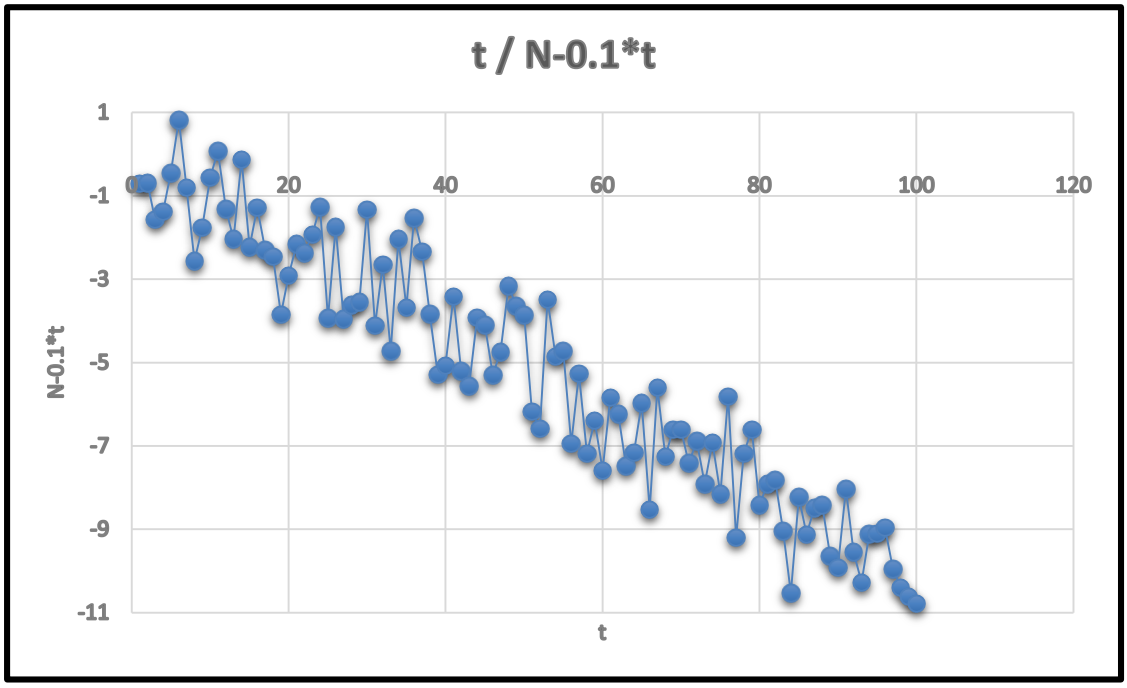


FIGURE 9: KPSS TEST BAR LINE



`

FIGURE 10: KPSS ERROR BARS



KPSS-type assessments are anticipated to complement unit root tests, such as the Dickey-Fuller tests. Through analysing both the unit's root hypothesis and the stationary hypothesis, one can distinguish series that seem to be stationary, series that seem to have a unit's root, and series for which the data (or the tests) are not descriptive enough to ensure that they are stationary or integrated.

`

4.2. PRICE DISCOVERY IN DERIVATIVE MARKETS

TABLE 18: DERIVATIVE MARKETS PANEL DISCOVERY

	IS (Futures)	IS (Options)	CS (Futures)	CS (Options)	GIS (Futures)	GIS (Options)
Panel A: Event time sampling frequency						
Crude Oil	0.604	0.593	0.647	0.416	0.405	0.634
Gold	0.612	0.498	0.592	0.386	0.368	0.582
Panel B: 1- s Sampling Frequency (250 lags)						
Crude Oil	0.591	0.574	0.602	0.409	0.385	0.611
Gold	0.582	0.553	0.587	0.384	0.366	0.568
Panel C: Event time sampling frequency						
Crude Oil	0.613	0.579	0.608	0.403	0.399	0.589
Gold	0.618	0.569	0.598	0.389	0.383	0.576
Panel D: 1- s Sampling Frequency (80 lags)						
Crude Oil	0.588	0.548	0.587	0.389	0.378	0.546
Gold	0.594	0.565	0.578	0.398	0.387	0.526

Note: It tracks the average discovery of options and futures market price shares for each asset. Price discovery shares are determined using: (a) the knowledge share of Hasb/rouck (1995) (IS), (b) the part share of Gonzalo-Granger (1995) (CS), and (c) the information leadership share of Yan and Zivot (2010)/Putni ⁇ š (2013) (ILS). In Panel A (B), market discovery steps are recorded in which we survey prices at the sampling frequency of event time (1 s) and use 250 lags in the VECM. Price discovery methods are recorded in Panel C (D) in which we survey prices at the sampling frequency of event time (1 s) and use 80 lags in the VECM. Gray shading suggests estimates of price detection greater than 0.50. Between April 2009 to March 2019, our sample time. Abbreviation: CS, part shares; GIS, generalised shares of information; IS, shares of information; VECM, correction model for vector errors.

Discovery of prices over time. Between January 2009 to March 2019, it tracks the average options market price discovery shares for each product. Price discovery shares are determined using: (a) the knowledge share (IS) of Hasbrouck (1995), (b) the part share (CS) of Gonzalo-Granger (1995) and (c) Yan and Zivot (2010)/Putniš's (2013) information leadership share (ILS). Measures for market discovery are determined using prices sampled during event time and using 250 lags in the model for vector error correction.

`

TABLE 19: UNIT ROOT TEST RESULTS: AUGMENTED DICKEY FULLER (ADF) TEST

Commodities	Null Hypothesis	Observation	t-statistic	p-value
Crude Oil	Futures prices series has a unit root Spot prices series has a unit root	2486	-3.7022 -3.0465	0.0042 0.0309
Gold	Futures prices series has a unit root Spot prices series has a unit root	2486	-4.2591 -4.5863	0.0005 0.0001

Significance level: 0.05%

TABLE 20: UNIT ROOT TEST RESULTS: PHILLIPS-PERRON (PP) TEST

Commodities	Null Hypothesis	Observation	t-statistic	p-value
Crude Oil	Futures prices series has a unit root Spot prices series has a unit root	2486	-3.7412 -3.1524	0.0012 0.0130
Gold	Futures prices series has a unit root Spot prices series has a unit root	2486	-4.2841 -4.6845	0.0004 0.0000

Significance level: 0.05%

`

TABLE 21: PAIRS-WISE GRANGER CAUSALITY TEST RESULTS

Commodities	Null Hypothesis	Observation	F- statistic	p-value
Crude Oil	Spot price series does not Granger Cause Futures price series	2486	12.6274	0.0096
	Futures price series does not Granger Cause Spot price series		6.2641	0.0067
Gold	Spot price series does not Granger Cause Futures price series	2486	5.0124	0.0125
	Futures price series does not Granger Cause Spot price series		8.6412	0.0014

TABLE 22: DESCRIPTIVE STATISTICS BY THRESHOLD VARIABLE

	Volatility	*Volume*	*Contracts*
Mean	0.748	1256242	2342.26
Median	0.345	625121.5	1241.2
S.D.	0.384	102513.8	1421.08
Skewness	2.15	3.41	3.04
Kurtosis	12.08	18.45	15.36
Max	0.947	19754823	25846
Min	0	0	0

`

TABLE 23: JOHANSEN'S CO-INTEGRATION TEST

	Lag Length	Max Eigen Value	Trace Statistics	Critical Value
CRUDE OIL				
Future Prices	2 Lag	148	161	15.49
Spot Prices		3.64	3.59	3.43
GOLD				
Future Prices	2 Lag	152	142	142
Spot Prices		2.96	2.89	2.34

The table includes the co-integration test of Johansen, the maximum Eigen value and the Trace test statistics are used to interpret whether the null r=0 hypothesis is rejected at the 5% stage and not rejected where r=1. Null hypothesis denial means that there is at least one co-integrating parameter in our case that confirms a long-term balance between the two factors, spot and potential values. The null hypothesis is dismissed in 2 commodities where there is a non-cointegration relationship between spot and futures rates. Maximum Eigen value and trace test statistics are used to determine if the null r=0 hypothesis is rejected at the 5% level and not rejected at the r=1 level. Null hypothesis denial means that there is at least one co-integrating parameter in our case that confirms a long-term balance between the two factors, spot and potential values.

TABLE 24: GRANGER CAUSALITY TESTS

CRUDE OIL	
DV: FUTURE PRICES	P (0.03)
DV: SPOT PRICE	P (0.02)
GOLD	
DV: FUTURE PRICES	P (0.03)
DV: SPOT PRICE	P (0.05)

The findings suggest bi-directional Granger leads in all goods between spot and future partnerships. In summary, the findings confirm that all commodities except Turmeric have a price discovery mechanism. This makes the futures market more effective and

cost-competitive in terms of knowledge, thereby ensuring their leading position in price discovery.

TABLE 25: DISTRIBUTION OF FIRMS MARKET CAPITALISATION

Panel A: Sector-based distribution	**% MC**	**Mean MC**	**SD**
Energy	20.26	48	0.34
Bullion	16.87	34	0.27
Panel B: Size-based distribution			
Size 1	36.42	68	0.42
Size 2	32.12	53	0.25
Panel C: Average pair-wise cross-sectional correlations (APCC)			
Energy	0.73		
Bullion	0.69		

The distribution of firms in our sample is represented in this table in relation to the overall market capitalisation (MC) and the average cross-sectional pair-wise sector-based correlations. For either of the two sectors, Panel A reports the distribution of business representation, with the number of firms in each sector appearing in square brackets, while Panel B reports the distribution of firms by size. Panel C records the average pair-wise cross-sectional associations based on a test suggested by Pesaran et al. to catch the cross-sectional dependency (2008). Columns 2 and 3 of panels A and B report in percentage form and in dollar (billions) form, respectively, the number of all individual sector level market capitalizations compared to the overall market capitalisation. Panels A and B, Columns 4 and 5, represent the mean and the standard deviation (SD) of the market capitalisation at the firm stage, expressed as a proportion of the overall market capitalisation. Around 60 percent of the US sector reflects the sample of companies covered in this report. It should be remembered that in developing

`

the scale-based committees, the last 3 companies were omitted in order to preserve a consistent number of companies in each size. Average correlations for panels with unadjusted returns are listed in column 2 of panel C, while average correlations for standardised (adjusted) panel returns are reported in column 3.

Chapter V
Findings & Interpretation

CHAPTER V- FINDINGS & INTERPRETATION

INTRODUCTION

The aim of this chapter is to place the whole research thesis on the skeleton and deliberate a conclusion I view of the research goals set. This chapter includes a description of the whole report, which in the next chapter is then tailed by the suggestions and conclusion as a finale. The scope of this research report also highlighted the full results of the study that make up this segment's crore. There is also a critical importance of this study in the segment. The overview of the key results is provided in this chapter on the basis of the thesis review as presented in the previous chapter.

We report descriptive statistics of daily futures and options trading activity in Table 5. Futures and open interest figures (expressed in thousands) were always higher than the corresponding choice forecasts. The amount of daily crude oil for futures (options), for example, is 892.65. The value of regular futures is comparatively much higher than the volume of options in the 640.89 gold market. Futures open interest on the crude oil and gold markets is higher (smaller) than options open interest (OI).

In comparison, quoted spreads are much smaller for standard futures than quoted spreads for options. For both commodities, typical futures (options) quoted premiums range between 0.005 and 0.6488 (0.218 and 11.491). Mean option spreads, for example, are about twenty times larger than futures spreads in the markets for gold and crude oil.

The mixture of reduced market activity and larger quoted option spreads means that options are slightly less liquid than futures. Option prices are also expected to be noisier than futures prices, affecting the ability of traditional price discovery measures to predict price discovery correctly (Yan and Zivot, 2010; Putniš, 2013).

A required criterion for data from a time series is that the data must be stationary. For the selected sequence, the stationary tests produced by Augmented Dickey Fuller were conducted, and the results were displayed in the table. For the series, Phillips and Perron (1988) stationary experiments were also carried out to double check the robustness of

`

the findings. The results of this test are listed in the table 12. Using the Akaike Knowledge Criterion, the optimal lag numbers of each sequence were evaluated by the (AIC). It was observed from the calculations of the Augmented Dickey Fuller (ADF) and Phillips Peron (PP) test results that the sequence at their stages were stationary.

If two or more series are non-stationary themselves, but a linear combination of them is stationary, then it is stated that the series is co-integrated. Because the same order is inserted into and product spot and future prices, co-integration strategies are used to evaluate the nature of a consistent long-run relationship between the price pairs. Due to communication costs, the arrival of new information results in the discovery of values for short periods between futures and spot markets. Increased accessibility and reduced information prices combined allow for a quicker assimilation of information than a spot market in the futures market (Koontz et al., 1990).

The study of cointegration shows the degree to which two economies have progressed into long-term equilibrium together. Secondly, in the short term, it allows for the deviation of the corresponding stocks from the long-run balance. The co-integrating vector defines the presence of long-term order, while the dynamics of error correction explain the mechanism of price discovery that allows markets to reach balance (Schreiber and Schwartz, 1986). The co-integration of methods essentially continues with the non-stationary nature of the level series and minimises the discrepancy arising from the long-run equilibrium deviation. Not only are the stochastic process and spontaneous shocks in the system driven by the observed deviations from long-run equilibrium, but also by other forces such as the arbitration process. As a result, the arbitration mechanism has dominant influence in the potential market of goods to mitigate the very possibility of short-term disequilibrium. Moreover, if future and spot prices are co-integrated, it is logically believed that it indicates the existence of causality in at least one direction. In the other hand, it does not mean that all level series are co-integrated if any level series are integrated in the same order. Cointegration means linear combinations that cancel the stochastic pattern in both level series, thereby creating a stationary series. The cointegration test by Johansen is more sensitive to the lag duration used. In addition, excessive lag length can give rise to problems either over or under parameterization. The purpose of the calculation is to ensure that in the residuals there is no serial association. Here, to select the optimum lag length, the

`

Akaike Knowledge Criterion (AIC) is used and all associated calculations have been performed embedding the lag length. The results of the co-integration are listed in the table .The stated F-statistic value and likelihood value showed that between the chosen futures price series and the lean Hogs spot price series there was bi-directional causality; and so is the case for the demand for pork bellies as well. It was also observed in the case of this market that the sequence of futures prices triggers spot price series and vice versa.

Researchers recommend a price discovery panel data model. We realise that with regard to the CDS spread, sectors and sizes of companies are heterogeneous; therefore, we shape market panels based on sectors and sizes of companies and apply co-integration panel and VECM panel to estimate price discovery. Second, we not only analyse all 2 stocks, but also consider the 2 stocks of investment grade, and examine whether the proof of market discovery for stocks of investment grade is different from all stocks. Third, we have an economic importance measure for investors of the importance of market discovery.

Although the stock market contributes to price discovery in two sectors, we find that the CDS spread leads to price discovery in two sectors. It is the stock market that dominates the price discovery phase in the 2 industries in which both the stock and the CDS markets lead to price discovery. We note an improvement in the position of the CDS market in price discovery when we consider only investment grade firms: in seven of the 2 industries, the CDS market contributes to price discovery but does not control the mechanism of price discovery, the stock market does Scale-based stock panels reveal clear evidence of the effects of size. Both the stock and CDS markets lead to the process of price discovery in most stock volumes, but it is the stock market that dominates the process of price discovery. The degree of price discovery also varies with magnitude.

Although the price discovery mechanism is dominated by the stock market, its output is higher in the crisis era compared with the pre-crisis period. The discovery of prices in both phases is very size-dependent. Our final contribution is to create the relation between the discovery of prices and economic importance. We forecast CDS returns using our recommended PVECM in sectors where all markets lead to price discovery

`

and the stock market dominates the price discovery phase. We find good evidence that, as opposed to a model which simply ignores the position of price discovery, a mean-variance investor would be able to make comparatively more gains from a price discovery model (PVECM).

PRICE DISCOVERY ESTIMATES

For each material, we forecast price findings using conventional and modern analytical techniques. Table Panel A lists the average daily values calculated using rates sampled during the event duration and using 250 lags in the VECM. In both situations, all IS and CS futures (values slightly higher than 0.50 and respectively between 0.50 and 0.70) show that commodity futures on average are the first to reflect new information in relation to options markets. In the figure, the time series of options for price discovery between 2009 and 2019 is given. We encountered downtrends in both the IS and CS options in the second half of the survey duration for crude oil, natural gas, gold, and silver, (noting that futures IS is one minus options IS, similar for futures CS).

GIS, on the other hand, indicates that futures contribute to the impounding of new knowledge between 2009 and 2019 on average commodity options, with average prices ranging from 0.578 to 0.643, the difference being crude oil, where GIS options are 0.487.

Boyd and Locke (2014) also discover that futures of natural gas contribute to market discovery options using futures IS between 2005 and 2007. Our analysis contrasts with Boyd and Locke (2014), as we use current market discovery techniques to focus our analysis, we use price quotes in case time to estimate price discovery (rather than 15-min snapshots), we evaluate a more recent sample period capturing substantial volume increases from electronic trading and increased liquidity, and we also analyse price discovery in five days. Our market discovery forecasts are robust for: (a) sampling prices at a 1-s frequency (see Table B) and (b) using VECM 80 lags.

In the second half of the survey period, the figure shows upward trends in GIS options for energy and metal commodities. Due to developments in electronic/real-time trading, the ability to incorporate numerous options trading strategies, weekly options contracts,

`

the closure of the futures trading pit by the CME, and so on, these trends can be correlated with an improved preference for knowledgeable options trading (Sammann, 2015; Simon, 2014). Options/futures The ILS is relatively constant for agricultural commodities. Provided that the noise differentials between the two markets are oblivious to GIS, the most accurate reflection of price discovery between the two markets is likely to be produced. Our results show that both options and futures are valuable sources for informed investing, with the prevailing position being options over more recent periods of time.

A required criterion for data from a time series is that the data must be stationary. For the selected sequence, the stationary tests produced by Augmented Dickey Fuller were performed and the results were presented in the table 14. For the series, Phillips and Perron (1988) stationary experiments were also carried out to double check the robustness of the findings. The results of this test are listed in the table 18. Using the Akaike Knowledge Criterion, the optimal lag numbers of each sequence were evaluated by the (AIC). It was observed from the calculations of the Augmented Dickey Fuller (ADF) and Phillips Peron (PP) test results that the sequence at their stages were stationary. The pair of wise Ganger Causality tests were performed to demonstrate whether future price series are induced by spot price series or vice versa, and the results were given in the table.

In the table, descriptive statistics of the four credit spread series are shown (Panel A). The overall shifts in the distribution of the four stocks and their uncertainty since the subprime crisis was higher. The kurtosis and skewness measurements suggest that, irrespective of the sub-period considered, the distributions of the CDS shifts for the four markets are not natural. In each sub-period, the sequence of spread shifts are autocorrelated and illustrate clear ARCH effects. All the spread stages are non-stationary and they are made stationary by first differentiation. The statistics of the Johansen trace test indicate that the sequence of spreads are co-integrated variables that share a common factor. Two lags are chosen for the implementation of the Johansen trace test and the VECM.

`

The (unconditional) IS (Information Share) measure for each sector during each sub-period is reported in Table Panel B. However, we can see that the stock market continues to play the leading role in price discovery until June 23, 2008, in the first part of the crisis era. Then, in the heat of the crisis, just before and even after Lehman Brothers' default, the option market is obviously leading the way. Lastly, from the second quarter of 2009, after the recession subsided and financial prices started to rebound, the share market returned to its leading position before the crisis.

For both the VAR model calculated for the four credit spreads and its augmented variant, which substitutes the lags of the changes in the credit spreads with the cross-products of the changes in each vector and its corresponding conditional IS calculate, Panel C of the Table records the mean square errors. Our observations suggest that allowing for time variance in market discovery increases the VAR model's forecasting capacity as the mean squared error values are often smaller than those of the normal VAR for the expanded regressions. In this article, we extract a complex measure of price discovery that provides the ability to represent the time-varying action of the information in a simple and intuitive way flow among markets. In particular, in the credit spreads received from the CDS, bond, equity and option markets, we look at the price formation process. We illustrate, with a case study, how multivariate GARCH models can be used to measure a time-varying variant of the price discovery predictor of Hasbrouck (1995). Our findings illustrate the variability of the movement of information through markets and affirm its high exposure to shifting factors in the industry. In addition, we provide a clear example of how this time-varying measure can be used to boost a traditional econometric model's forecasting power.

The F-statistic value reported and the chance value indicated that there was bi-directional causality between the Crude Oil spot price series and the chosen futures price series; and so is the case for the Gold market as well. It was also observed in the case of this market that the sequence of futures prices triggers spot price series and vice versa.

The threshold variable sets the predicted market volatility, volume, and contract as the thresholds of the threshold regression model and speculates that the knowledge flow is

`

responsible for volatility. Several research (Kwaller et. al. 1987) and Chan (1992) have shown that data would flow to the future market first, then to the spot market. To see if the content of knowledge can affect the lead-lag effect, we use a threshold regression model.

Chapter VI
Conclusion

CHAPTER VI- CONCLUSION

INTRODUCTION

The simple objective of this segments is to sketch a summary and deliver the conclusion in the perspective of the established research objectives. This chapter introduces the summary of the entire research trailed by the recommendations and conclusion at the end. The scope of the study was also emphasized along with the exhaustive findings of the study which has become the core of this segment. The section also offers the importance of the research in the study.

The motivation for this thesis report arises from developments in the ability to trade commodity derivatives and resulting increases in trading activity, a lack of understanding regarding the role of futures options in price discovery, and due to a continued debate regarding the role of hedgers and speculators in the price formation of commodity derivatives. As a result, we provide a unique examination of price discovery in two different commodity futures options markets and we analyze the role of speculators and hedgers in the price discovery process. Using intraday data, we estimate conventional and new empirical measures of price discovery, noting that they measure different components of price discovery. In our setting, IS and CS partly measure the relative level of noise between the two markets, and ILS captures the relative speed with which each market reflects new information (this is the traditional focus of using empirical measures of price discovery).

Furthermore, using open interest and volume data, we use two measures—R to identify speculation and hedging activity in commodity derivatives markets Despite lower levels of liquidity, on average we find that options lead futures in reflecting new information in the crude oil, gold, silver, corn and soybean markets. For example, such findings are consistent with recent developments in trading platforms allowing various market participants the flexibility and ease to trade a variety of options strategies. Although a majority of price discovery occurs in options (approximately 0.55–0.60), a large fraction of price discovery occurs in futures markets (approximately 0.40–0.45), indicating that informed trading occurs in both venues.

`

In addition, we find that speculation is a significant determinant of price discovery in commodity derivatives. More specifically, we report that increased speculation in commodity derivatives is associated with increases in the options market's contribution to price discovery and such a result is consistent with the theory of backwardation. In examining price discovery between markets of differing levels of liquidity, our findings highlight the importance of accounting for the noise differential using empirical measures such as ILS.

We conclude that Indian commodities market is still not perfectly competitive for some commodities. Overall, the price discovery results are encouraging given the nascent character of Indian commodity market. The commodity market in India needs strong policy support owing to its relevance in the macro economy with implications for price inflation, economic growth and employment. Hence there is an urgent need that the policy makers to support these trading platforms with infrastructure development, fiscal incentives, encouraging product innovation, widening investor base and investor education so that they are able to realise their true potential. Consequently, the institution of manager (or investor) should understand the futures markets clearly and supervise (or invest) properly to ensure the efficiency of futures market. More importantly, the international pricing authority in Indian futures market should be improved as quickly as possible in order to maintain economic security. The present research contributes to alternative investment literature for emerging markets.

Future research can examine the level of price discovery in other commodity and other derivative markets. Furthermore, with the increasing popularity of futures options, increases in electronic trading, changing regulation and market structure, further research can examine the drivers of trading activity and price discovery, especially as other countries/ exchanges introduce commodity derivatives trading Platforms.

Chapter VII

Future Suggestions & Limitations

CHAPTER VII- FUTURE SUGGESTIONS AND LIMITATIONS

INTRODUCTION

In this chapter researcher go through future recommendation, Just the three major indices in spot and future demand commodities are analysed in this report. We can clearly interpret the lead-lag effect by adding the option to this research, and the strategies may have the highest performance. Between numerous stocks and indices, the lead-lag impact still occurs. Furthermore, only single business knowledge is used on the basis of the threshold element in this analysis.

The report made use of secondary knowledge. All the shortcomings found in secondary data are embedded in the information compiled from the secondary data. Which could affect the findings. The data was not available in some instances.

In order to differentiate the relationship condition of two markets, we will use the future market and spot market characteristics to form a ratio and we also discuss whether the spot market situation will affect the lead-lag impact relationship.

Their final step would allow the continuous selling of the spot market, which is the same as the future market. If the spot market is still engaged in continuous trade, this situation would be closer to other countries. The lead-lag effect would be smaller than before and even decrease to a few seconds with the advent in technology and wider use of algorithm trading and high frequency trading. That is to add, we need quicker pace for evaluating the market situations in order to exploit the lead-lag effect.

We suggest that the improvement in the spot market's matching mechanism would have a substantial impact on the strength of the lead-lag effect. The speed of trade is potentially the main point for deciding the efficiency of the trading strategy.

In addition, studies will explore this topic from many perspectives, such as market liquidity, counterparty risk, discovery of credit risk, etc. Both price discovery measures are often focused on a linear co-integration process and the rolling window approach is

`

used to gain contributions to the time variable price discovery, so it is also important to analyse the process of credit risk discovery in a non-linear co-integration system

The final recommendation for future study is therefore to investigate the directional and complex causality relationship between the returns of sovereign CDS and the commodity index in both mature and developing economies using a non-linear markov switching system.

References

REFERENCES

1. Agarwal (July 14, 2017). "Introduction to the Stock Market". Intelligent Economist. Retrieved December 18, 2017.

2. "All of the World's Stock Exchanges by Size". 2016-02-16. Retrieved 2016-09-29.

3. Neal, Larry (2005). "Venture Shares of the Dutch East India Company", in Goetzmann & Rouwenhorst (eds.), Oxford University Press, 2005, pp. 165–175

4. Murphy, Richard McGill (1 Jul 2014). "Is Asia the next financial center of the world?". CNBC.com. Retrieved 11 Mar 2017.

5. "IBM Investor relations - FAQ | On what stock exchanges is IBM listed ?". IBM.

6. Ortega, Edgar; Yalman, Onaran (December 4, 2006). "UBS, Goldman Threaten NYSE, Nasdaq With Rival Stock Markets". Bloomberg.com. Retrieved 2011-05-31.

7. Mamudi, Sam (June 13, 2014). "Dark Pools Take Larger Share of Trades Amid SEC Scrutiny". Bloomberg.

8. Amedeo De Cesari, Susanne Espenlaub, ArifKhurshed, and Michael Simkovic, The Effects of Ownership and Stock Liquidity on the Timing of Repurchase Transactions (October 2010). Paolo Baffi Centre Research Paper No. 2011-100.

9. "Market capitalization of listed domestic companies (current US$) | Data Graph". data.worldbank.org. Retrieved 2015-12-17.

10. Statistical Abstract of the United States: 1995 (Report). United States Census Bureau. September 1995. p. 513. Retrieved 2015-12-17.

`

11. Statistical Abstract of the United States: 2012 (Report). United States Census Bureau. August 2011. p. 730. Retrieved 2015-12-17.

12. Rydqvist, Kristian; Spizman, Joshua; Strebulaev, Ilya A. (2013-01-01). "Government Policy and Ownership of Financial Assets".

13. Changes in U.S. Family Finances from 2007 to 2010: Evidence from the Survey of Consumer Finances (PDF) (Report). Federal Reserve Board of Governors. June 2012. p. 24. Retrieved 2015-12-17.

14. Changes in U.S. Family Finances from 2010 to 2013: Evidence from the Survey of Consumer Finances (PDF) (Report). Federal Reserve Board of Governors. September 2014. p. 20. Retrieved 2015-12-17.

15. Vissing-Jørgensen, Annette (2003). "Perspectives on Behavioral Finance: Does 'Irrationality' Disappear with Wealth? Evidence from Expectations and Actions". NBER Macroeconomics Annual. **18**: 139–194. CiteSeerX 10.1.1.195.7189 . doi:10.1086/ma.18.3585252.

16. Shiller, Robert: The United East India Company and Amsterdam Stock Exchange, in Economics 252, Financial Markets: Lecture 4 – Portfolio Diversification and Supporting Financial Institutions. (Open Yale Courses, 2011)

17. "World's oldest share". The World's Oldest Share. Retrieved 8 August 2017.

18. "Dutch history student finds world's oldest share". Guinness World Records Limited 2014. 10 Sep 2010. Retrieved 8 August 2017.

19. "Student finds oldest Dutch share". Radio Netherlands Worldwide. September 10, 2010. Archived from the original on August 8, 2014. Retrieved August 8, 2017.

20. Dunkley, Jamie (11 Sep 2010). "Dutch student finds world's oldest share certificate". Telegraph.co.uk. Retrieved 8 August 2017.

21. Stringham, Edward Peter: Private Governance: Creating Order in Economic and Social Life. (Oxford University Press, 2015, ISBN 9780199365166)

`

22. Stringham, Edward Peter (5 October 2015). "How Private Governance Made the Modern World Possible". Cato Unbound (www.cato-unbound.org). Retrieved 15 August 2017.

23. Petram, Lodewijk: The World's First Stock Exchange: How the Amsterdam Market for Dutch East India Company Shares Became a Modern Securities Market, 1602–1700. Translated from the Dutch by Lynne Richards. (Columbia University Press, 2014, ISBN 9780231163781)

24. Shiller, Robert (2011). Economics 252, Financial Markets: Lecture 4 – Portfolio Diversification and Supporting Financial Institutions (Open Yale Courses).

25. Macaulay, Catherine R. (2015). Capitalism's renaissance? The potential of repositioning the financial 'meta-economy'. (Futures, Volume 68, April 2015, p. 5–18)

26. Brooks, John (1968). "The Fluctuation: The Little Crash in '62", in "Business Adventures: Twelve Classic Tales from the World of Wall Street". (New York: Weybright & Talley, 1968)

27. Tracy, James D. (1985). A Financial Revolution in the Habsburg Netherlands: Renten and Renteniers in the County of Holland, 1515–1565. University of California Press. ISBN 0-520-05425-3.

28. Goetzmann, William N.; Rouwenhorst, K. Geert (2005). The Origins of Value: The Financial Innovations that Created Modern Capital Markets. Oxford University Press. ISBN 0-19-517571-9.

29. Goetzmann, William N.; Rouwenhorst, K. Geert (2008). The History of Financial Innovation, in Carbon Finance, Environmental Market Solutions to Climate Change. (Yale School of Forestry and Environmental Studies, chapter 1, pp. 18–43). As

30. Sylla, Richard (2015). "Financial Development, Corporations, and Inequality". (BHC-EBHA Meeting). As Richard Sylla (2015) notes, "In modern history, several nations had what some of us call financial revolutions.

31. Neal, Larry (2005). "Venture Shares of the Dutch East India Company,", in The Origins of Value: The Financial Innovations that Created Modern Capital Markets, Goetzmann & Rouwenhorst (eds.), Oxford University Press, 2005, pp. 165–175

32. Stringham, Edward Peter: Private Governance: Creating Order in Economic and Social Life. (Oxford University Press, 2015, ISBN 9780199365166), p.42

33. De la Vega, Joseph, Confusion de Confusiones (1688), Portions Descriptive of the Amsterdam Stock Exchange, introduction by Hermann Kellenbenz, Baker Library, Harvard Graduate School of Business Administration (1957)

34. "World Federation of Exchanges Monthly YTD Data". World-exchanges.org. Archived from the original on June 11, 2011. Retrieved May 31, 2011.

35. Rothbard, Murray: Making Economic Sense, 2nd edition. (Ludwig von Mises Institute, 2006, ISBN 9781610165907), p. 426

36. Cesari, Amedeo De; Espenlaub, Susanne; Khurshed, Arif; Simkovic, Michael (2010). "The Effects of Ownership and Stock Liquidity on the Timing of Repurchase Transactions". Paolo Baffi Centre Research Paper No. 2011-100. SSRN 1884171 .

37. Simkovic, Michael (2009). "The Effect of Enhanced Disclosure on Open Market Stock Repurchases". Berkeley Business Law Journal. **6** (1). SSRN 1117303 .

38. "Financial Stability Frameworks and the Role of Central Banks: Lessons from the Crisis" (PDF).

39. Levine, Ross (2002). "Bank-Based or Market-Based Financial Systems: Which Is Better?". Journal of Financial Intermediation. **11** (4): 398–428. doi:10.1006/jfin.2002.0341.http://www.iosco.org/library/pubdocs/pdf/IOSCOPD354.pdf

40. "Future of computer trading". www.gov.uk. Retrieved August 14, 2015.

41. Alexander, K.; Dhumale, R.; Eatwell, J. (2006). Global Governance of Financial Systems: The International Regulation of Systemic Risk. Oxford University Press. ISBN 0-19-516698-1.

42. "Historical Returns". nyu.edu. Retrieved August 14, 2015.

43. Cutler, D. Poterba, J. & Summers, L. (1991). "Speculative dynamics". Review of Economic Studies. **58** (3): 520–546. doi:10.2307/2298010.

44. "OpenStax CNX". cnx.org. Rice University. Retrieved 22 February 2017.

45. Mandelbrot, Benoit & Hudson, Richard L. (2006). The Misbehavior of Markets: A Fractal View of Financial Turbulence, annot. ed. Basic Books. ISBN 0-465-04357-7.

46. Taleb, Nassim Nicholas (2008). Fooled by Randomness: The Hidden Role of Chance in Life and in the Markets, 2nd ed. Random House. ISBN 1-4000-6793-6.

47. Tversky, A. & Kahneman, D. (1974). "Judgement under uncertainty: heuristics and biases". Science. **185** (4157): 1124–1131. doi:10.1126/science.185.4157.1124. PMID 17835457.

48. Morris, Stephen; Shin, Hyun Song (1999). "Risk management with interdependent choice" (PDF). Oxford Review of Economic Policy. **15** (3): 52–62. doi:10.1093/oxrep/15.3.52.

49. David Fabian (February 9, 2014). "Why The Market Doesn't Care Where You Think It Should Go". Seeking Alpha. Retrieved August 14, 2015.

50. Sergey Perminov, Trendocracy and Stock Market Manipulations (2008, ISBN 978-1-4357-5244-3).

51. "News Headlines". Cnbc.com. October 13, 2008. Retrieved March 5, 2010.

52. Shiller, Robert (2005). Irrational Exuberance (2d ed.). Princeton University Press. ISBN 0-691-12335-7.

53. Completing the Circuit: Canadian Regulation, FIXGlobal, February 2012

`

54. Chris Farrell. "Where are the circuit breakers". Archived from the original on October 28, 2008. Retrieved October 16, 2008.

55. Philip Ball (April 26, 2013). "Counting Google searches predicts market movements". Nature. Retrieved August 28, 2013.

56. Nick Bilton (April 26, 2013). "Google Search Terms Can Predict Stock Market, Study Finds". New York Times. Retrieved August 28, 2013.

57. Jason Palmer (April 25, 2013). "Google searches predict market moves". BBC. Retrieved August 28, 2013.

58. "Sharemarket Game". asx.com.au. Retrieved August 14, 2015. https://economictimes.indiatimes.com/definition/stock-market https://www.sharetipsinfo.com/stock-market-types.html

59. "Soft Commodity Definition". Investopedia. 15 February 2009. Retrieved 6 December2012.

60. O'Harrow, Robert (21 April 2010). "A primer on financial derivatives". Washington Post.

61. "Opportunities and Risk: an Educational Guide to Trading Futures and Options on Futures" (PDF). Chicago, Illinois: National Futures Association. 2006. p. 6.http://chicagofed.org/webpages/publications/understanding_derivatives/index.cfm

62. "The Regulation of Derivatives in Canada". Expert Panel. 2007.

63. Loder, Asjylyn (18 July 2010). "Commodity Manipulation May Be Easier to Prove After Overhaul". Bloomberg.

64. Bytom Lauricella (2 November 2009). "Gold Mutual Funds Vs. Gold ETFs: It Depends on the Goal". Wall Street Journal. Retrieved 3 October 2011.

65. "The Future of Commodity ETFs". Morningstar. 25 August 2009. Retrieved 3 October2011.

`

66. Banerjee, Jasodhara (16 January 2013). "Origins of Growing Money". India: Forbes India Magazine.

67. Sinha, Ram Pratap; Bhuniya, Ashis (7 January 2011). "Risk Transfer Through Commodity Derivatives: A Study of Soyabean Oil". Social Science Research Network (SSRN). SSRN 1736406

68. The Historical Value of Silver: A 2000-Year Overview

69. Dijkman, Jessica Elisabeth Catharina (18 June 2010). "Medieval market institutions: The organisation of commodity markets in Holland, c. 1200 – c. 1450" (PDF). pp. 1–2.

70. Stringham, Edward (2003). "The Extra-legal Development of Securities Trading in Seventeenth Century Amsterdam". Quarterly Review of Economics and Finance. **43** (2): 321. SSRN 1676251.

71. "History of the CFTC: U.S. Futures Trading and Regulation Before the Creation of the CFTC". U.S. Commodity Futures Trading Commission.

72. "Variations of commodities in trading". Options Trading. Retrieved 29 March 2016.

73. US Commodity Futures Trading Handbook Volume 1 Strategic Information and Regulations. ISBN 1577516095.

74. Markham, Jerry W. (1987). The History of Commodity Futures Trading and Its Regulation. Praeger. p. 305.

75. "The Food Bubble", Frederick Kaufman, Harper's, 2010 July

76. O'Sullivan, Arthur; Sheffrin, Steven M. (2003). Economics: Principles in Action. Upper Saddle River, NJ: Pearson Prentice Hall. p. 288. ISBN 0-13-063085-3.

77. McGowan, Michael (2011). "The rise of computerized high frequency trading: use and controversy". Duke Law & Technology Review.

`

78. Johnson, David. "Stock Market Goes Decimal: Complicated fractions abandoned in favor of pennies".

79. Lane (Deputy Governor of the Bank of Canada), Timothy (25 September 2012). "Financing Commodities Markets presented to the CFA Society of Calgary". Calgary, Alberta.

80. Firzli, M. Nicolas; Bazi, Vincent (2011). "Infrastructure Investments in an Age of Austerity: The Pension and Sovereign Funds Perspective". Revue Analyse Financière, volume 41. Archived from the original on 17 September 2011.

81. Fontevecchia, Agustino (15 April 2013). "Violent and Panicky Gold Selling Collapse Bullion and Commodity Markets". Forbes.

82. Gorst, Isabel (17 April 2013). "Russia and less than $100 oil". Financial Times Blog. Retrieved 17 April 2013.

83. Garner, Carley. A Trader's First Book on Commodities. (New Jersey: FT Press, 2010): pg. 19.

84. Futures Trading Act of 1921, Declared unconstitutional in Hill v. Wallace 259 U.S. 44 (1922), the Grain Futures Act of 1922 and Board of Trade of City of Chicago v. Olsen 262 U.S. 1 (1923).

85. William D. Coleman (2003). Governing Global Finance: Financial derivatives, liberal states, and transformative capacity (PDF). GHC Working Paper 01/2.

86. Dennis W. Carlton (1984). "Futures Markets: Their Purpose, Their History, Their Growth, Their Successes and Failures". Journal of Futures Markets. **4** (3): 237–71. doi:10.1002/fut.3990040302.

87. Bienkowski, Nik. "Exchange Traded Commodities Led by Gold, ETCs Opened the World of Commodities to Investors" (PDF). Alchemist. The London Bullion Market Association (48).

88. Opalesque (14 January 2010). "Black Rock's global ETF's hit an all-time high of $1tln".

89. "Benchmark Asset Management Company conceptualises Gold ETF". Etfglobalinvestor.net. Retrieved 3 October 2011.

90. "Largest ETFs: Top 25 ETFs By Market Cap". ETFdb. Retrieved 3 November 2010.

91. Michael Sackheim, Michael Schmidtberger& James Munsell, DB Commodity Index Tracking Fund: An Innovative Exchange-Traded Fund, Futures Industry (May/June 2006).

92. Koyfman, Yevgeniy (21 August 2009). "No Gas: Barclays Halts Issuance of Natural Gas ETN". Index universe.com. Retrieved 3 October 2011.

93. Jon Gregory. Counterparty credit risk. ISBN 978-0-470-68576-1. p. 7. Commodities Trading report

94. "Trade statistics for international business development". Trade Map. 20 September 2013. Retrieved 26 September 2013.

95. Marius Vassiliou (2009). Historical Dictionary of the Petroleum Industry. Lanham, MD: Scarecrow Press. ISBN 0-8108-5993-9.

96. Smith, Grant (26 November 2012). "Brent Poised to Depose WTI as Most-Traded Oil Futures". Bloomberg.

97. Popper, Nathanial (13 April 2012). "Diamonds as a Commodity". The New York Times.

98. "The Importance of Iron Ore Derivatives - The International Resource Journal". www.internationalresourcejournal.com. Retrieved 2016-09-06.

99. See the Futures Trading Act of 1921, Declared unconstitutional in Hill v. Wallace 259 U.S. 44 (1922), the Grain Futures Act of 1922 and Board of Trade of City of Chicago v. Olsen 262 US 1 (1923).

100. "Final Rule Regarding the Definition of Agricultural Commodity" (PDF). Commodity Futures Trading Commission Office of Public Affairs. 21 July 2010.

`

101. "Definition of Agricultural Commodities". Law at Cornell. Cornell University. February 2013.

102. Brown, Veronica (15 April 2013). "Gold set for worst two-day loss since 1983". Reuters.

103. "Encyclopaedia of Commodity and Financial Prices: Grains and Oilseeds" (PDF). Commodity Research Bureau (CRB). pp. 172–187.

104. Clapp, Jennifer (5 December 2012). "Position Limits for Agricultural Commodity Derivatives: Getting Tougher or Tough to Get?". Triple Crisis.

105. Henn, Markus (October 2012). "European Parliament decides to tackle commodity speculation: a little bit". Centre for Research on Multinational Corporations (SOMO) (14).

106. Maroo, Jay (13 November 2012). "Commodity position limits cause Mifid II confusion". Energy Risk.

107. Banks, Martin (27 September 2012). "EU parliament approves moves to end 'abusive' speculation in commodity markets". European Parliament.

108. Reeve, Nick (29 March 2012). "Mifid amendment calls for commission ban to be scrapped". Financial Times. Archived from the original on 21 May 2012.http://indianstockmarket.nriinvestindia.com/

109. Inani, Sarveshwar Kumar. (2017) "Price discovery in Indian commodity market." International Journal of Business and Emerging Markets 8, no. 4.

110. Joshy, J. K ., and L. Ganesh.(2016) "An Empirical Analysis of Price Discovery in Spot and Futures Marketof gold in India." Pacific Business Review International, 10th ser., 7 (April 2015): 80-88.16): 361.

111. Afonso, António, Michael G. Arghyrou, George Bagdatoglou, and Alexandros Kontonikas. 2015. On the timevarying relationship between EMU sovereign spreads and their determinants. Economic Modelling 44: 363– 71.

`

112. Polanco-Martínez, Josué, and Luis Abadie. 2016. Analyzing crude oil spot price dynamics versus long term future prices: A wavelet analysis approach. Energies 9: 1089.

113. Zavadska, Miroslava, Lucía Morales, and Joseph Coughlan. 2018. The lead-lag relationship between oil futures and spot prices—A literature review. International Journal of Financial Studies 6: 89.

114. Retrieve from http://www.laurel-cook.com/home_htm_files/Causa l%20 Research % 20 Design-%20Experimentation.pdf