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## A STUDY ON THE OPTIMAL NUMBER OF FIRMS TO BE USED TO CARRY OUT A RELATIVE VALUATION ANALYSIS: A STUDY OF SECTORS IN THE INDIAN ECONOMY

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**Abstract:** This article aims to identify the relationship between the accuracy of firm value attained by using different number of comparable companies to carry out a relative valuation. A major question regarding relative valuation is the most optimal number of comparable firms to be used, this study aims to answer that question by looking at 14 sectors in the Indian economy. The study finds the enterprise value of each target company selected by using a range of comparable companies, from the closest comparable company to the top ten closest comparable and finds the enterprise value. The study then identifies the absolute error and presents its findings regarding the most optimal number of firms to be used to attain the most accurate enterprise value in a relative valuation process. The study also analyses the effect of the overall number of firms in the sector and if this has an effect on the error value attained by using the industry multiple for the valuation process, thus, answering the question of if a sector with many firms provides a more accurate enterprise value of the target that a sector with a smaller number of firms. This helps confirm the market effect on the valuation process.

**Index Terms –Business Valuation, Relative valuation, comparable company analysis, multiples-based valuation.**

### 1 INTRODUCTION

#### 1.1 INDUSTRY PROFILE

##### 1. Agriculture

Agriculture is the most important and largest source of earnings for more than fifty percent of the nation's populous. The gross value added by the agriculture sector to the Indian economy was valued to be at Rs. 19.48 lakh crores for the financial year 2021. The national food grains sector is positioned with the potential for immense growth, developing and increasing its weightage in the global food trade each year stemming from its extreme potential for value addition, specifically in the food and grain processing sector.

##### Market size and growth

During the previous financial year, the food and food grain industry was estimated to have produced approximately 300 million tons of produce and harvest. India also houses one of the largest horticultures and livestock production sectors with a production level of 320 million metric tons and a population of 540 million livestock respectively. India is a leading exporter of food and crops the world over being the leader of export in many products such as sugar and cotton. The industry is expected to experience a 4.9% to 5.5% CAGR across the next five years according to studies making it a stable source of income for citizens and the economy.

##### Government incentives

- The government initiated a food park in many areas including Punjab to develop the accessibility of food grain for suppliers and farmers
- The government plans to invest Rs. 21,000 crores into food grain, dairy and fisheries over the next three years across 21 states
- The agriculture export policy was introduced to help grow the export of food grains and harvest with government support to reach \$100 million in the next two years
- The government has pledged to provide Rs. 2000 crores to the Primary Agriculture Credit Society (PACS) to aid the integration of the usage of cooperative technology across the country
- The government invested Rs. 50,000 crores to increase the irrigation and waterway facilities in the country to maximize production

## 2. Cables

A cable is any wire which is made of metals or similar products which is used for the transmission of electricity, information or data. The demand for energy and electric power is forecasted to grow two-fold over the next few years. This in turn has grown the demand for as well as the investments in the energy and cables sector to satisfy this demand which requires the movement and transmission of this energy to all parts of the nation. This is being reflected in the growth of the cables industry of the country, which is a driver for the development of the entire energy sector as cables are the primary source of energy movement. The growth of the power sector is driving the demand and supply of cables in the country, making many companies grow in size and value. The digital revolution occurring not only in the country but internationally, requires cables to be produced and sold in large quantities as the growth and integration of digital aspects of everyday life requires internet integration which is directly aided by cables and systems. The industry 4.0 boom is responsible for the demand increasing for data transmitting cables and wires. Furthermore, the development and implementation of underwater cable systems between countries and continents require a large amount of cables and innovation in the cable industry, both of which are helping in the development of demand in this sector.

### Market size and growth

The global industry is estimated to be of a \$200 billion value. It is estimated to reach \$365 billion in the next five years. The cable industry is approximately 40% of the Indian electric industry. The industry is seeing a CAGR of 15% presently making it one of the most attractive industries of the economy with a lot of potential as well as a lot of movement and development happening with government and private industry support.

### Government incentives

- The government has invested Rs. 2.6 lakh crores for a five-year period for power transmission and distribution which is dependent on the production and sales of cables
- The government has set a target of generating 100 GW of energy sourced from solar power and this will require a high amount of cables to aid, which will help development
- The aim of the government to set up 20 smart cities annually will also aid the growth of this industry.

## 3. Cement

The country, by volume and value is the 2<sup>nd</sup> highest producer and seller of cement in the world. India displays immense potential for the growth and betterment of the infrastructure and construction industry and the main driver for the same, the cement industry is estimated to greatly attain advantages from the same. In the recent past there are been multiple situations due to which the cement sector has seen a boom in growth and also potential for further growth, such as plans for creation of 100 smart cities, which is estimated to give a considerable push to the sector and the value derived by it. Aided by sustainable and large legislative foreign laws and policy, numerous foreign firms including Lafarge and Heidelberg are invested in the country and its cement sector since multiple years. A very important aspect which helps with the growth of the cement industry is the excessive existence of raw materials and resources for the production of cement, such as limestone and coal.

### Market size and growth

The production of cement in the country was at the level of 329 million tons for the financial year 2020. The consumption, though, of cement in the country is at 327 million tons and is growing at a rapid pace and showing no signs of slowdown. The production capacity of the national cement industry is 550 million tons. With most cement companies seeing a large amount of market growth with drivers such as rural development and urban planning, the demand is also on an uptrend. The CAGR of this company is 13.6% to 14% showing a lot of potential for investments and returns.

### Government incentives

- The central government has set aside Rs. 1390 crore for the urban rejuvenation mission which will require a great level of cement production and sales helping the companies of the sector boost their sales
- The PM Awas Yojna also placed an investment of Rs. 18,000 crores for the help of setting up an estimated 30 lakh houses which will help cement industry sales

## 4. Chemicals

The chemical industry is one which is very important in the world, with multiple uses and numerous important innovations, its one which can and has historically redefine industry and products. The sector has almost 80,000 commercial products, India's chemical sector is very diverse and broad. The sector can be generally divided into bulk chemicals, agrochemicals, specialty chemicals, petrochemicals and polymers. Another very important product line of the chemical industry is the fertilizers which is in high demand with the size of India's argi industry. India counts for nearly 16% of the global manufacturing and processing of dyes colorings and dye sub products. The Indian color and dye sector have come up as an integral supplier and manufacturer with an international market control of close 15%. India's closeness to the Middle East, the global marketplace of petrochemicals and petroleum related raw material, allowed it to leverage and make the most of on economies of scale and cost of procurement.

### Market size and growth

The production of pure chemicals reached a peak of 10 million tons in the financial year 2020. Specialty chemical concentrate almost 25% of all chemical manufacturing and processing. With the demand and supply of petrochemical products and byproducts increasing there is a clear roadmap for companies to make the most of this situation and profit from the same.

There has been a considerable decrease in the import of finished petroleum and chemical products in India to the tune of 39% showing a major shift towards self-sustenance and domestic production and consumption. Furthermore, there has been a growth in exports of the same.

The CAGR of the chemicals industry can be divided into two aspects, the petrochemical industry experiencing a 7.5% growth and agro and chemicals industry experiencing an 8.5% growth.

#### Government incentives

- The 2034 vision for chemical and petrochemical industry has been established to develop the production and processing capabilities through government support and subsidies
- The government made the FDI openness to a 100% automatic entry route to promote developments in the chemical manufacturing sector.
- The PCPIR policy has been renewed to reflect a Rs. 10 lakh crore investment

### **5. Consumer Foods**

Indian consumer foods industry is generally divided into urban markets and rural markets. It has become one of the most valuable and exciting industry for manufacturers and distributors from across the globe. The industry is defined by a massive middle class willing to spend on this industry in large quantities, relatively large upper segment and a very minimal economically backward segment. Global firms see the nation as one of the most vital markets where future growth is likely to sprout and grow exponentially due to this high demand availability. The growth in India's consumer market is and will be mainly pushed ahead by the existence of a large populous comprising of individuals with a large sum of increasing disposable income.

#### Market size and growth

The country is the 6<sup>th</sup> largest consumer of food and grocery retail. Retail segment accounts for almost three fourths of the total industry sales. It is the fifth largest industry by volume as well as exports and manufacturing. It contributes to 8.9% of the total gross value added to the market. The segment is seeing a fast paced CAGR of 20% which is very attractive for investments and companies. with the growth of online delivery agents such as Swiggy the accessibility has only developed and grown leading to a further push to the CAGR and industry size. The organic segment is expected to grow threefold by the end of 2021 with unprecedented amounts of investments into this segment.

#### Government incentives

- There has been the initiation of a 100% foreign direct investment into the sector allowing for entry of numerous foreign firms to enter and leverage the industry demand
- Food product e-commerce FDI has been freed completely making it open to any automatic investment route by the foreign companies
- The food and safety authority of India is investing Rs. 500 crores to strengthen the testing facilities and certification program for foodstuff in the economy to aid in the development and protection of customers
- The HRD ministry is developing training for individuals to enter the food and food processing sector.

### **6. Fertilizer**

The nation of India is one which is highly dependent on agriculture and its products for its economic development, with contribution reaching 17.1% in the nations GVA. The fertilizer industry is one which has been earmarked with consistent growth and innovation, which has been due to the high demand existing in the agriculture industry. With numerous issues being faced by farmers and their produce, the demand for good fertilizer which can effect change has consistently been rising through the years. The fact that the production of food grains increased from a mediocre output of 52 million tons in 1951, reaching a massive value of 284.95 million tons in 2018, is a signal for the aid which fertilizers have given in the productivity of agriculture in the industry. The aim of the nation's food grain production is at 291.10 million tons, in this, an integral role is being played by chemical and organic fertilizers.

#### Market size and growth

The actual output of all the companies in the nation producing fertilizers during the year 2019 was estimated at 414.85 million tons. The expected output of all fertilizer types during the year 2020 was estimated to be approximately 462.15 million tons signifying a growth greater than 11.40% which was the growth value of the previous year, this is in line with the growth of the agricultural output of the nation. The quick and speedy expansion of fertilizer output in the economy has been attained as a direct result of favorable government laws and national macroeconomic environment providing great flexibility and freedom in investments in the all three sectors.

The sector CAGR is at 12% for the next five years with a high growth in agriculture productivity.

#### Government incentives

- New urea policy of 2015 helps with the production process of fertilizers in the country
- The NUP-2015 is aided with government subsidies in the purchase of raw materials for the production of fertilizers
- The NUP-2015 helped with investments towards the training and education of farmers about the importance of using fertilizers in the nation to maximize output
- Energy subsidies have been provided for manufacturing units of fertilizers by the union government.

### **7. Hospital and Healthcare**

The healthcare industry is one which is among the largest in the country of India, not only in the aspect of revenue but also with the amount of employment provided by the sector to the citizens. The sector includes services such as hospitals, clinical trials, medical devices, health insurance and the manufacture of products such as medical equipment and machines. The nation's healthcare industry is rapidly expanding backed by a lot of reasons such as an expansion in healthcare accessibility, provisions of healthcare services and a great level of incremental investments in to the sector by both by public as well private players. India's healthcare sector can be subdivided into two parts, the public healthcare industry and the private healthcare industry or component. The public healthcare component is marked by the involvement of the government, both at the national and state level, who oversee and control public

healthcare, this aspect of the sector contains care institutions in most regions and areas which is majorly focused on the provision of the minimum level of healthcare. It is also characterized by the involvement of clinics in rural areas to provide free healthcare to those who cannot afford it. The private component of the healthcare sector provides care with concentration in metros and large cities. The nation's greatest resource in the sector is its highly skilled and large number of doctors and nurses. The expense incurred for a surgery in India is only 10% in comparison to the same one in a western nation. India places 145 for of quality and accessibility towards healthcare.

#### Market size and growth

The market size presently of the healthcare sector is Rs. 4.7 lakh crores in the country, this includes hospitals, medical manufacturing, equipment manufacture and health insurance etc. the Indian health tourism is expected to reach an 8% growth in the next few years making it a very attractive investment opportunity. The CAGR of the healthcare industry of India is at 17%-18% making it a high growth sector. The Indian health insurance sector is growing at a faster pace, at 19% making it also one for investments and profitability.

#### Government incentives

- The budget has allocated Rs. 36,000 crores for nutrition programmes
- The GOI is aiming to increase healthcare spending to 3% of the total national GDP

## **8. IT - Software**

The IT industry of the country is one which is experiencing growth and development like no other and is seeing changes which are affecting the entire economy at large and also having a direct impact on the entire global economy and its smooth functioning. The IT field is going through extremely quick movements and is reshaping the way in which business is conducted not only in the nation but across the globe. This industry is inclusive of software development, software consultancies, management of software and online cloud management, BPO. The sector is expecting a lot of growth over the next decade with the high level of movement of businesses onto an online medium with the growth of e-commerce the world over. This is an apparent indicator which signifies that IT is a sector will come out to be one of the country's most important sectors and one which the global economy also dearly depends on. The global sourcing market is expanding at a rate which is quicker than the IT sector of India, this signifies that there is a lot of scope to fill demand across the world by Indian firms. India is the primary outsourcing choice for companies across the world, with almost 50% of all services being carried out in India. India has become the internet and online competency center of the globe with approximately 75% of digital and internet talent originating in the country.

#### Market size and growth

The Indian IT sector is presently at a mammoth Rs. 14 lakh crores and is showing no sign of slowing down anytime soon. The industry is poised to reach a value of Rs. Rs. 25 lakh crores by the end of the financial year of 2025. The export revenue attained from just the IT industry of India was approximately \$147 billion in the year 2019 alone. The top 4 Indian IT companies among them hosts a talent pool of more than a million Indian/

The CAGR of the Indian IT sector is expected to be at a stable 10% and shows no sign of a slump in this rate for the foreseeable future.

#### Government incentives

- The government is developing the ease of doing business in the IT sector with new guidelines
- The government has set up a Rs. 5000 crore funds to aid in the recognition of this industry
- The government has invested in the setting up of a national AI portal

## **9. Pharmaceuticals**

The Indian pharma industry is the largest manufacturer and seller of generic drugs in the world. The Indian pharmaceutical industry provides an excess of 50% of global demand for numerous vaccines, 40% of the generic medication requirements in the United States and 25% of all medical requirements in the United Kingdom. The Indian pharma sector holds a very integral place in the worldwide pharmaceuticals industry. The nation also boasts a huge number of pharma experts in the form of R&D scientists and medical and pharmaceutical engineers with the ability to drive the entire sector towards further growth on the back of more developments in the medicines being produced and the cost of production. India is a leader in global pharma and is one whose influence is felt the world over. It is the largest manufacturer and supplier of generic medicines worldwide, holding a staggering 20% share in global trade by volume. India is 3<sup>rd</sup> globally for production of medication by volume and 14<sup>th</sup> globally by the value of medication produced and delivered. The nation houses more than 3,000 pharma firms with a very well-established delivery and R&D network.

#### Market size and growth

The entire sector is nearing the Rs. 7 lakh crore mark with a lot of demand being identified globally, especially with the pandemic which hit the world in 2020. The export of drugs and herbal products stood at a massive \$2 billion in 2020 which is extremely high. The domestic market is not small by any measure, hosting a value of Rs. 1.5 lakh crore being one of the largest sectors by value and demand.

The CAGR of the industry stood at 12% which is again one of the quickest growing industries of the country, backed by a lot of healthcare developments domestically as well as globally. This sector is one which has potential far outweighing most other sectors of the Indian economy.

#### Government incentives

- A global medical center is to be set up in India under the UN for medical research
- The government announced a PLI scheme hosting a value of Rs. 15,000 crores
- The union budget invested Rs. 65,000 crores to the health ministry to develop pharma
- The government is setting up a guideline and policy for medical distribution online
- The expenditure of the GDP on healthcare is being increased to 1.6%

## 10. Plastics

The plastics industry is one which experienced staggering growth in the last decade with no downturn, but with the adoption of environmentally friendly alternatives it was expected to slow the industry, but this has not hindered the manufacturing nor sales of the sector which is still growing at a quick pace. The nations plastics sector is having upwards 25,000 firms and provides jobs for individuals in excess of 30 lakh. The national domestic production volume for polymers stood at 5.72 million tons in 2009. Gujarat is the leader of plastic production, processing and manufacturing in the country with more than 5000 production houses and companies functioning out of the state. The growth that is being seen in the Indian plastics industry is one of the greatest in the globally. With growth in plastics nearing growing at 16% yearly, there is a lot of potential. With an exploding middle-class segment who are increasing their disposable income, and alongside with a low per capita plastic consumption, the industry has a lot of ground to cover in terms of demand in the economy. India has a massive labor force but still has a shortage of individuals being demanded for work in the plastics industry as the demand is so vastly high. This increased demand but low supply has allowed the industry to innovate and use more machines to increase the productivity and automate processes to minimize the costs of production.

### Market size and growth

The plastics export from the nation was valued at Rs. 58,000 crores. The highest of this was plastic raw materials followed closely by plastic sheets. There is a high space for growth in the industry which has a lot of demand to fulfil not only globally but also domestically. Being one of the quickest growing industries in the country, the CAGR of the sector is at 8.8% and is not slowing down. There has been a growth in the number and type of plastics being produced in India with the growing demand for specialized plastics domestically and globally. The industry operates with an efficacy of upwards of 85% which is one of the best in the world.

### Government incentives

- Financial and tax assistance being provided by the central government for new plastic companies
- VAT and interest subsidy for loans and sales on small and medium scale plastics manufacturing firms

## 11. Real Estate Construction

The real estate construction sector of the nation is made primarily of urban development, rural developmental segment and the real estate segment. The real estate aspect has numerous types of areas and structures under it such as offices, parks, hotels and other such service amenities for individuals. Under urban development comes the segments such as sanitation, transportation aid such as roads and rail, hospitals, clinics, sanitation and sewage services etc., all of which are integral to the living standards of citizens. The real estate construction sector is poised to become the highest employer of all sectors in the economy, with a rising growth and expanding demand for development of real estate. The nation is expected to require approximately 76.5 million employees and laborers in the building, construction and real estate industry by the end of the next financial year. Affordable housing is the next largest demand segment in the sector, where more than 38 million individuals are expected to be required by the end of the decade. Approximately 80% of development in real estate in the country is occurring majorly in the residential real estate segment presently, following which is the services segment and amenities for the populous such as hospitals, office complexes and entertainment buildings etc.

### Market size and growth

At the end of 2025, the real estate constructions sector is going to be the 3<sup>rd</sup> largest globally. The current growth being witnessed us at a stable 7.1% rate. The equipment's industry for real estate constructions has reached a value of Rs. 36,000 crores. Office spaces and warehousing is rising to be the most important aspect of the real estate constructions and developments investment sector. National real estate amassed a sum total of approximately Rs. 37,500 crores of investments. It is further estimated that the NRI investments in the sector will grow further. Bangalore is going to be the primary target for such NRI investments, after which will come cities such as, Pune, Goa, Delhi and Chennai.

### Government incentives

- 100% FDI under automatic route is permitted in completed projects for operations and management of townships, malls/shopping complexes, and business constructions.
- 100% FDI is allowed under the automatic route for urban infrastructures such as urban transport, water supply and sewerage and sewage treatment.

## 12. Retailing

The nations retail sector has developed to become one of the most rapidly growing, innovative and customer centric industry of India and is one competing with global standards of quality and volume. The consumption expenditure by the Indian population is expected to grow by almost 100% in three years which makes the country one which is very attractive for investments and companies. This sector is estimated to host a value of 10% of the total economy, hosting a total of 8% of the total employment numbers in the country. The country is the 5<sup>th</sup> biggest economy in terms of retail movement and demand. India ranks very high in the global index for business to customer delivery and volume movement. With the nations ease of doing business index rising, the retail sector is positioned to have a boom. The country has become a prime destination for individuals and institutions to invest in the retail segment given the high consumption demand with growing disposable expenditure. There is a consistent rise in the demand for goods in all sectors, especially consumer electronics etc., this is a situation which the retail sector can leverage as it is the direct contact for customers and businesses.

### Market size and growth

The country can be divided into E-retail and brick and mortar retail, the brick and mortar retail are nearing value of Rs. 20,000. India has become the most rapid growing economy for e-commerce with the growing demand and disposable income seeing a y-o-y growth of 10% and more. Following an unexpected market decline of almost 20% in the Q1 2020, the retail sector is showing signs of recovery. With the opening up of the economy, there will be a bounce back of the industry to pre-pandemic growth rates.

The industry is experiencing a CAGR of 13% making it an industry which has the brightest outlook in the economy, this makes it the best option for investment for any business.

Government incentives

- There is an expected change to occur in the FDI rules for E-commerce and retail to ensure that all the existent potential is leveraged in the nation
- There has been an allowance of 100% direct FDI through an automatic route to ensure that foreign firms can enter the nation without any hinderance and utilize the huge demand which is in the economy and continually growing.

**13. Steel**

The nation is identified as the second largest steel manufacturer globally with a production level of 115 million tons in the financial year of 2019. The expansion of the nation's steel industry is being pushed by the availability of domestic demand as well a rising global demand by many countries in the west as well as Asia. The country is also being driven by the advantage of having low cost labor to aid in the production and processing of steel in the nation. These advantages have led to the nation attaining most of its contribution of manufacturing GVA from the steel sector. The steel industry has also in recent times experienced a technological expansion to include many updated and new machinery. Companies consistently invest in the development of manufacturing capabilities. The quick rise in the production capabilities of the nation's steel sector has helped India become the 2<sup>nd</sup> biggest supplier globally. The country is also experiencing a growth in steel consumption being the second highest consumer of steel, beaten only by China.

Market size and growth

The country is expecting a CAGR of 5.2% of finished steel and steel related goods reaching almost 150 million tons in the previous financial year. The nations steel and crude steel production and manufacturing volume reached 110 million tons in the financial year of 2020. 2020 saw a high volume of steel production irrespective of the pandemic causing a crunch in the demand domestically and globally. The exports of finished steel were 8 million tons in the final quarter of FY20 with imports at only 5.5 million tons making the sector a net exporter. Estimates show that the domestic demand will outweigh the global average. The per capita consumption of steel and steel related products in India is approximately 45kg, which is considerably lower than the global average, but there are clear indicators of a growth in this value over the next few years.

The CAGR of the steel industry stands at 7% which is slightly on the lower end but this is majorly due to the consolidation of this industry to a high level.

Government incentives

- The "Athmanirbhar" campaign of the government of India has provided special attention to the steel manufacturing industry given its massive size and contribution to the GDP
- An export duty has been levied to help support domestic consumption requirements
- The import duty has been raised by 2.5% to ensure protection of anti-dumping laws.

**14. Sugar**

The nation is the global leader in the manufacture of sugar and sugar related products and is also one of the largest exports of the same competing with countries like Brazil and Cuba. This is a capital-intensive industry having investments of RS. 2 lakh crores and is also an industry which is labor intensive, employing lakhs of individuals in both rural and urban India. By extension, this industry also helps directly and indirectly the farmers who cultivate sugarcane, being the main raw material for sugar production. The sugar sector is one which is highly useful and integral to the development of rural India as well as aiding in the value being added to the GDP. The industry at large helps more than a 100 million individuals, farmers, businessmen, exporters, processing plants and others by providing them employment and a means of making money. The industry is facing an uphill climb of attain machinery which is up to industry and global standards to ensure sustainable farming as well as productivity maximization. While many of these issues are presently being solved, there is a great need for the development of R&D in the sector to help the farmers and producers of sugar with knowledge which can help them maximize the output and quality of their produce.

Market size and growth

The country has more than 600 million mills which help with the employment of numerous individuals in rural and urban India, producing a massive 30 million tons of sugar. Sugar cane, the raw material of sugar has grown to approximately 400 million tons, making the production of sugar increase proportionately. The consumption of sugar in the country is approximately 2 lakh tons annually, leaving a major bulk of the product having the capability of export and foreign trade.

The CAGR of this industry is presently at 4.5% which is slightly on the lower end in comparison to the other selected industries of this study.

Government incentives

- sugar mills have a Rs. 3500 crore subsidies for export of sugar and sugar-based products
- The government also provides financial aid for the set-up of MSME sugar mills
- The government is planning education programmes under the agriculture ministry to help with the communication of processes and practices to maximize the productivity of the sector.

Valuation of firms is one of the most important aspects of the financial services industry. The process and technicalities of valuation have been discussed and researched upon at length. There are numerous ways in which one can approach the methods of valuation of any commodity, service, asset, firm, equity or intangible. Valuation is one of the key aspects of a business' decision making as its value should reflect any decision it makes to find out if a business transaction or deal is worth the accurate amounts. Valuation not only help a company identify the value it must demand in case of a merger or acquisition – though this is the most common usage of valuation – it also is used while planning and exist strategy, planning a strategic approach to the company's future and investment requirements, it also comes into use when a company is going out to look for funding of its operations. Valuation has been debated to be a very layered and complicated procedure, with many scholars and practitioner deeming it more of an art than a science, which requires an experienced valuer to maximize the accuracy and other practitioner conforming to the view that valuation is in fact a high scientific process which can be done in great detail so long as all aspects of a business are taken into consideration during the valuation process.

The three most commonly used and agreed upon valuation methods are the historical transaction approach, which looks at past transactions of similar nature and values the present accordingly. The relative valuation approach, which takes into consideration valuation multiples from comparable companies or firms in the industry and uses this to find the target companies value. And finally, the most complicated and arguable most detailed process, the DCF or the discounted cash flow method.

Each of these methods have been extensively researched upon and have a lot of technical basis for their usage.

This study looks at the "Relative Valuation" method of valuation. This method is one which is the most commonly used in industry practice. The method has two main aspects to it, selection of comparable firm and decision of multiple to be used. Both of these aspects are highly technical and require a great level of study before anything can be decided regarding them. I have noticed that there are innumerable studies done on both the selection of comparable companies as well as the selection of the perfect multiple to be used in each individual industry.

## 2 LITERATURE REVIEW

### (Andreas Schreiner, 2007)

This paper evaluates the methods and processes involved in the selection, analysis and implementation of valuation multiples for the valuation of equity and entity. This study dives deep into the intrinsic drivers of value related to each valuation multiple as well as identifying the industries for which each multiple works most optimally. The fundamentals of equity valuation are used to leverage the information derived from each value driver to identify the best multiples in a generic view as well as identifying certain specialized multiples for specific situations. This study also delves into the identification process behind the selection of the comparable, or comps, which are the firms similar to the company being valued. This study was done using empirical data and a detailed analytical study of all four steps of the multiple's valuation process. The study finds that the equity-based multiples far supersede the entity multiples in providing accurate values of a company's value. Once the equity is estimated accurately, finding the entity value is a far simpler process than if we had to find the value of equity when we had the value of the entire entity. It also concludes that knowledge-based multiples are better than traditional multiples in industries which are based on pure sciences. The study also finds strong evidence in the support of forward-looking multiples, such as the two-year forward P/E in comparison to a trailing multiple based on historical data.

### (Azrac, 2005)

This study aims to find the criteria for the identification and selection of comparable firms. In the perfect situation, comparable would have the exact same values for financial situation, ownership conditions and the yearly outputs and inputs, it would also have a completely symmetrical operating structure, operations flow and a management based which would be equivalent to the firm being valued. But, this in practice is not practical nor is it even remotely possible. With the level of dynamism in the business world, there can never exist a clear and equal comparable for any company no matter how similar they look in a generic view. Even in a very concentrated and finely defined industry, firms may be similar, but are never symmetrical. Therefore, this study informs us to collect a list of firms based on the finest definition of the industry, making it as technically sound as possible. Once we do this, the study suggests that we must further filter this list by excluding firms with different historical patterns in decision making as well as future prospects and aims. We must then group those firms which have similar growth rates in their financial and non-financial data in comparison to the company we are aiming to value. The study concludes that even having five or less than five true comparables is better than taking into consideration a large data set to only reduce the accuracy of the output, irrespective of how contradictory it may seem to the general process of data validation.

### (Spremann, 2002)

This is a crucial study which identifies the difference between trading multiples and transaction multiples, which is a very important and extremely different in the process of multiples valuation. The first type of multiple is used for trading of securities and deciding in whether buying a stock or taking over a company through open market purchasing is a viable solution. The second type of multiple is one which values a corporate transaction, such as putting up an offer to purchase a company either through equity or even as a leveraged buyout. Corporate transactions usually involve a large amount of change to the internal and external processes of the company as these transactions are made to benefit the acquiring company's functioning. Thus, in most cases where valuation is required, a transaction multiple is of more use and better in terms of information analysis as compared to a trading multiple. The study also comes up with a result which shows how the premium being paid for a company can go up to a margin of even fifty percent its value, and this is largely dependent on the overall market conditions.

### (Penman, 2004)

This study addresses a very important but commonly overlooked issue in the multiple's valuation process. It speaks about the importance of using data which has the same definition and formula across all the companies, industries and multiples we have selected. Data, be it financial data or valuation multiples can be different based on either being historical, trailing, forward looking or rolling, each of these provide a different view of the same output, thus it may give us skewed results if we take these values without smoothing them to a single calculation method. Thus, study suggests that while carrying out a multiples valuation, the valuer should themselves collect the raw data from each area they wish to analyse and create their own valuation multiples based on their assumptions and understanding, thus ensuring that all data is even and will not have any results which are irregular. The valuer must clearly define their analysis tools and create these tools from scratch instead of extracting pre calculated data to minimize any data and output irregularities.

### (Cheng and McNamara, 2000)

This study looks at the rarely studied field of combination of multiples in a multiples-based analysis. The study firstly identifies P/E and P/B multiples as the two most reliable and accurate multiples in a general view of the multiples-based valuation approach. They then attempt to find out the accuracy if these two multiples are combined. The study shows how the combined P/E P/B multiple in the US equities market always outperforms the individual P/E or P/B multiples. This implies that both earnings and book values are

extremely important aspects of a valuation procedure and it also implies that they cannot be separated as they have an intrinsic effect on one another. But, these two, while being dependent on one another are not equivalent to each other as they are not substituting, but only complimentary. The study concludes where only industry membership definition is enough to define a peer group or a group of comparable for a combined multiples valuation analysis.

**(Ricardo Serra, 2018)**

This study carries out an in-depth analysis into the similarity of industry multiples across different geographical areas and evaluates whether the same multiples have the same effect and utility in all markets equally. This study looks specifically at the Brazilian markets and compares it to the American counterpart to prove its hypothesis. It used the same tests for companies and industries across both the geographical regions with similar clusters and economic fundamentals. The study uses three main multiples, the P/E, P/B and the FV/EBITDA. The study values companies in both economies using this multiple and identifies whether there was any variability within firms in the same industry across two countries and if there was an intrinsic variability across the two countries themselves. The study concludes with the findings that there does exist a significant level of variability between the two geographical regions in the usage of and outputs derived from the same multiples. This, the study concludes is due to differences in business practices as well as macroeconomic situations of both countries. The study suggests any valuer to identify and use the best valuation multiple which will provide the most accurate values in the given economy. In case of cross border valuation, the valuer must take into consideration the external environment and then make the requires assumptions or apply the requires premiums or discounts to the final valuation estimated.

**(Erik Lie, 2002)**

This study was carried out to identify and analyses the most optimal multiple which can be used to yield results which are most accurate and consistent in relation to actual performance of companies. the study finds that mean valuation errors exist, but are generally negative or close to zero in most cases. The asset valuation multiples are usually more accurate and provide better estimates of value than the sales or revenue-based multiples such as EBITDA multiple. The study concludes that adjusting cash levels does not smooth the valuation process or have any direct benefit on the company value. This study also proves that using forecasted earnings for P/E multiples is better than using trailing earnings to attain a better P/E multiple. In cases where the valuer has to use sales multiples, it is better to use the EBIT multiple as compared to the EBITDA multiple as seen by the results of the study showing a greater correlation between the real and estimated values using the EBIT multiple in comparison to the EBITDA multiple.

**(Kaplan and Ruback, 2000)**

The study estimated valuations for a sample of highly leveraged transactions based on the market value to earnings before interest, taxes, depreciation, and amortization. The most commonly used multiples were the general multiples for firms in similar industry, companies which were involved in similar businesses or transactions, or firms in the same industry that were part of similar transactions. For comparison, the study also estimated valuations by using the discounted cash flow process. For the study, the first batch of 51 highly leveraged companies between 1983 and 1989, it found both the discounted cash flow and multiple methods to be accurate valuation methods with comparable levels of accuracy. Depending on the multiple used, 37%–58% of the valuations fell within fifteen percent of the real-life transaction value.

**(Alford, 2010)**

The study evaluated the effect of the choice of the firms to be used as comparable companies and identified that these comps selected on the basis of industry gave the output with the smallest estimation mistakes when valuing firms by use of the P/E multiple. To reduce the estimation errors in the studies analysis, it chose matching firms depending on industry. In particular, for each company whose value it was aiming to evaluate, the study finds all firms with the same three-digit primary SIC code to identify and calculate multiples. If lesser than five comparable were found, the study then made the industry requirement to companies with the same two-digit SIC code slightly more ease and open ended. To the extent where firms had operations in multiple sectors, the process for finding matching firms is suboptimal. Value accuracy can be developed if we separate each division of the firm and value it with comparable in that segment or sector.

**(Jacob Thomas, 2002)**

In this study an examination of the similarity to stock price through methods of valuation by attaining the product of a value driver, like earnings by its respective multiple, the multiple in this case is obtained from the ratio between stock market value to that value multiple or driver for a set of comps or comparable firms. While multiples are used very commonly in the industry, the numbers of studies which estimate the absolute and relative performance of different multiples is in short supply and is the aim of this study. The study aims to identify and evaluate the performance of a detailed list of multiples, and also study and identify a set of related issues, such as differences in performance over the industries and over a period of time and the performance increase or development obtained by employing different approaches to finding industry multiple values. The study in totality documents the level to which various value drivers serve as a summary statistic for the stream of estimates outcomes, and comps represent the target firm alongside major value attributes, like growth and risk. The study then concluded that multiples valued on the basis of forward earnings give us accurate values of stocks often for a majority of the selected samples. For relative performance, the estimations give us a view of historical earnings measures which ranked second to forward earnings measures, cash flow measures and book value measures are both third in accuracy and estimation risk, and sales value multiples performs the worst from the given sample set.



**(Thomas Plenborg, 2016)**

The study was done to evaluate, identify and communicate the best practices to be used while using a multiples-based valuation approach to finding the monetary value of any company, asset or institution. The study identifies that all valuation methods are an imprecise art, and thus we need to identify the best way to approach the valuation methodology, especially one which is as dynamic and flexible as the multiples-based approach. The study analyses the following aspects of the valuation process, choice of comparable firms, value driver options, decision for earnings values, accounting methodology differences, impact of firm size, impact of normalizing earnings and the illiquidity discount and control premium. The study finds that picking comps from the same industry with the same fundamentals is the most optimal approach to decisions about comparable firms. It identifies that accrual-based value drivers are more accurate than cash-based ones. Using expected earnings rather than the reported earnings give us a better view of the value of the same firm. Accounting differences have a negative impact on the firm value and thus need to be brought to a constant similarity before carrying out the valuation process. The study also found that large firms provide a greater value estimate than firms which are smaller in size. This study is a comprehensive analysis of certain very important factors in the valuation process.

**(Sanjeev Bhojraj, 2002)**

This study provides a generic method for choosing comparable firms' or comps for firm and equity valuation. Guided by multiple valuation theories, the study has developed a "warranted multiple" for each firm in the selected industry, and the study speaks of identifying compatible companies having the most similar warranted multiple. The study then evaluates this approach by studying the efficacy of the chosen comparable companies in its ability to predict the future enterprise-value-to-sales and price-to-book ratios. The evaluation and analysis include the general view of stocks as well equity values and other specific and unique stocks. The study then concludes that comparable companies chosen in this method provide sharp developments over comparable firms chosen through other non-analytical methods. This study takes a second look at the theoretical literature for the usage and implementation of market multiples in equity valuation, and it then develops an analytical step by step approach for the decision-making process of picking the "comps". In the process of employing multiples to value companies, assets and equity, analysts forego many benefits of a more complex but more detailed, pro forma analysis. In place of which, they attain a simple valuation process which provides satisfactory outputs without taking up a lot of time or causing a lot of cost for the valuer. The study finds that it is import to use comparable firms which work not only for said industry but have similar fundamentals as the target firm and also have similar outlooks for the future. The study also speaks of how different industries have different ratios which work best. Identifying these ratios is upon the valuer's discretion, but the study does provide certain examples of this selection process such as using a sales-based approach for industries where it is hard to value assets or industries which have high intangible assets on their balance sheet.

**(Manu Sharma, 2013)**

The study carried out is done to evaluate the conceptual framework for the process of relative valuation. The study analyses the process of picking comparable companies, the study identifies that while picking a comparable company, the valuer must take a look at the business profile, growth patterns, sectoral performance, market size and position, ROI and ROE, profitability, distribution channels, financial holdings, geographical, business processes, customer profiles majorly. The study states how finding primary financial data is of great importance to a valuer as finding this data in an accurate manner. This not only reduces valuation disparity but also helps valuers make informed decisions. The study also shows how finding multiples which work best for the chosen industry is a major decision which needs to be made by a valuer. It speaks about how book value multiples, earnings multiples or revenue multiples are separated and should be chosen carefully to ensure there are no valuation issues which occur.

**(Steven Young, 2015)**

The study identifies the effectiveness of the usage of pricing multiples over different situations. The study shows how the usage of enhanced accounting methods and comparability provides a greater level of accuracy of valuation in the multiples-based valuation process. Cross border transactions which require accurate valuation faced with multiple issues, require an effective accounting definition of identifying the most effective comparable. It identified that evaluating economic underlying factors is an important aspect of selecting comparable companies when it comes to cross border comparable sans cross border transactions. Market to book multiples produced greater accuracy of values. Accounting period alignment with the value accuracy was also an importance finding, specifying that value accuracy is dependent on the period used to forecast and find historical values and drivers.

**(Richard Sloan, 2012)**

The study looks at identifying the most effective way to select and utilize comparable companies while carrying out a relative valuation process. The study identifies the usage of EBIDTA to EV and EV to sales ratios as very effective for most companies while carrying out a blanket valuation. The study also states that using future growth values as one of the most important aspects while deciding a comparable company is not always effective as these are highly dependent on management requirements and plans with a great amount of emphasis on the ability of the firm to leverage its position. This leaves a better approach to be comparing the companies using their present situation and performance to make the most accurate value be found through the valuation process. The study states that valuation must be done with strict rules and rely less on the commonly used P/E multiples as has been carried out historically.

**(Stefano Paleari, 2014)**

The paper conducted an in-depth analysis to identify the most optimal procedure to adopt while carrying out a multiples-based valuation for companies wishing to enter into an IPO. The study looks at IPOs having taken place in European markets in all countries of Europe between 1999 and 2013. This includes approximately 500 IPOs. The study identifies that there are 6 most commonly used ratios during the valuation of companies for IPOs, the most popular ones being the P/E ratio and the EV/EBITDA ratio. The next ratio used often was the EV/Sales and EV/EBIT ratio. The study selects comparable using both an algorithmic and non-algorithmic approach. The

paper uses list of comparable as per the Thomson One base as well as using a ranking model based on the EV/Sales and EV/EBITDA performance of matching companies. It also uses a propensity matching model. It uses size and profitability for the matching model. The study identified a trend of overvaluation due to a premium tacked on to all valuation for IPOs in the sample, it concludes that using more biased selections using a multiple leveled approach to comparable selection can minimize this skewness of valuation at times of an IPO.

### **(Ciprian Codau, 2013)**

The study was conducted with the aim of identifying the factors which influence valuation multiples using a market approach to company valuation. The study uses 1823 companies across various stock markets and countries. The companies are divided into developed and developing countries. The study employs the EV/EBITDA ratio for the identification and evaluation of the accuracy of the ratio usage and the effects on said ratio. Post the financial crisis of 2008, most multiples began to prove ineffective for valuation as there were major fallacies in the accuracy and reality of many financial values. The study concludes that the usage of ratios is dependent on the size and sector of the company majorly. The multiples are seen to reduce with an increase in the size of the company across industry and samples to a rate of 85%. Inflation is seen to be statistically insignificant in developed countries and has no effect on the valuation multiple selected. But in developing countries, the inflation is positively correlated to the multiples, which means an increase in inflation rates leads to an increase in the valuation multiple. The study concludes that the EBITDA multiple is the most accurate multiple and provides the most accurate value across most sectors, it shows almost a 90% correlation between value accuracy and EV/EBITDA similarity between the companies chosen.

## **3 RESEARCH DESIGN**

### **3.1 RESEARCH OBJECTIVES**

This paper has two main objectives and questions it aims to provide a conclusive answer to, they are:

1. To identify the optimal number of comparable companies to be selected to attain the most accurate company valuation
2. To identify whether there is an effect on the accuracy of target firm value and the number of companies in the industry

This study is being carried out to provide clarity on using how many comparable companies or “comps” will yield the most accurate value for the target in question by analyzing the relative accuracy of the enterprise value of the target firm.

### **3.2 STATEMENT OF PROBLEM**

Valuation of companies is a field of study which has been at the forefront of industry and academia experts for years with numerous breakthroughs occurring, the practices have come a long way in the past and we have perfected many aspects of the valuation process up to our current knowledge and capabilities. Studies have been done in abundance in the method of selecting comparable companies and what steps must be taken to make the comparable selection process most effective and definitive, making it an area where there have been model developments to make the decision most informed, quantitative and objective. There have also been multiple studies made into the area regarding the selection of the most optimal valuation ratio or multiples, and the advantages of each in a given situation, research has also been conducted to identify the ratios which work best for certain industries and ratios which work best in a general valuation scenario during a blanket valuation process.

But there is still a very strong case to be made for the lack of studies into the area of the number of multiples to be used to attain an accurate figure of the target company value. there have been little to no studies on the number of firms to be selected to reflect an accurate target firm value. Most industry experts do this on a need basis and academia believes that this is dependent upon the discretion of the valuer, but I believe there must be a yardstick based on quantitative and historical data to guide valuers and provide them a starting point in selecting comparable companies.

This paper looks at the Indian economy, specifically certain industries of the economy which are chosen to cover a wide range of areas and provide a quantitative and conclusive answer to the question, what is the best number of firms to select to attain an accurate target firm value while carrying out a multiples-based analysis.

A major gap in this field is the question of how many comparable firms must be selected to provide us with the most accurate outlook of the target company. Thus, the study I have conducted will be looking into this aspect of relative valuation and I will present my findings after carrying out a detailed technical and data driven analysis of fourteen industries in the Indian markets, with which I am attempting to cover the all main type of industries, those where firms have a lot of tangible assets and another where firms derive their value from intangible assets such as IP and software.

### **3.3 SCOPE OF PROBLEM**

The valuation of a company is a process and practice which has long standing and important impacts on major decision in business and has implications on many aspects of the business scenario of an economy.

The inaccurate valuation of a company can leads to catastrophic failures as seen in the situations of companies like WeWork etc. it can lead to the purchaser of a company to overpay by large margins leading to them losing their financial stability and going bankrupt.

Valuation error can cause the value of companies to be misjudged during an IPO process which can lead to many people losing money they originally invested when the market corrects the price to reflect the market sentiment and actual intrinsic value of the company.

A valuation bias can lead to numerous litigation issues which can hold company’s hostage to the loss of their position in the market and lead to losses of not online finances but also human resources.

A hidden cost to valuation errors is one of strategic developments and developments and innovation, an inaccurate valuation can lead to the hinderance of the merger or partnership of companies, which otherwise would have led to a major strategic development and introduction of innovative and important products to the market. This loss is one which is hidden but is a real issue.

### 3.4 VARIABLES AND OPERATIONAL DEFINITION

The variables in the research are:

- Industry/Sector
- Companies
- Valuation multiple
- Firm value/Enterprise Value

Operational Definition:

#### 1. Industry/sector

- It is an area of the economy in which there are numerous companies, organizations, individuals or institutions connected by their commonality of product, service, process or functions and operations.
- The division of an economy into sectors is done to help with analysis and identification of merits and demerits as well as an accurate identification of performance and problems in the specific vertical.
- Sectors can be primary and secondary, divided on the basis of their approach to the usage of natural resources. Primary sector involves the extraction and usage of natural resources directly from nature and the planet, the secondary sector involves those companies involved in processing, manufacturing and production.
- Investors view sectors as specific divisions of the economy in which they can invest dependent on their risk appetite and investment objectives and portfolio requirement. Each sector is earmarked by its returns, effect on the overall economy, importance to the economy and ability to withstand issues which may arise in the economy.

#### 2. Company/Firm

- A company or firm is an entity formed by process of the law and recognized by the law as an entity which can involve itself in the any and all business processes by representing its owners and their ideologies and expectations.
- There are multiple types of companies based on their formation and legal abilities and liability, a few types are partnership, one person companies, limited liability companies, corporation, sole proprietorship etc.
- Companies can either be private or public and this distinction is one of major importance as it effects the way the company functions as well as the accountability of the firm management
- A company can act as a separate body with separate powers and liabilities from its management, owners and employees.

#### 3. Valuation Multiple

- A multiple in essence is a ratio, a ratio of two financial values of a company in question, compared against each other to provide insight into the effect one financial variable has on the other
- Multiples can be of numerous types such as growth multiples, liquidity multiples, profitability multiples and valuation multiples
- A multiple provides a quick view of the financial and operating abilities of the company and its position in comparison to its peers in the said industry and economy
- Valuation multiples are very important to the multiples-based valuation approach as it is the most commonly used valuation process in the industry
- Valuation multiples generally look to find the standing of a company's firm value or enterprise value against its other financial indicators such as share price, earnings, EBITDA, sales etc.

#### 4. Firm Value/Enterprise Value

- Enterprise value is a measure of the sum total value of a firm, organization, company or institution and is usually a substitute to equity capitalization value
- The EV includes all things which contribute value to a company, including the debt and loans held by the firm as well as the investors funds making it a good indicator of total value of a firm
- It is a very commonly used metric in the valuation of companies for any and all purposes as it provides a detailed insight into the price a company may be acquired or merged with at
- The enterprise value is popularly used as a part of valuation multiples, most commonly with another financial value, EBITDA. This multiple of both provides an in-depth view into the ability of the firm to make money given the overall value they have
- The EV is a financial value which is used as a purchase price or indicator, thus, should be evaluated with great care and detail to minimize valuation errors.

### 3.5 RESEARCH STATEMENT AND HYPOTHESIS

Research Statement

Usage of a greater number of comparable companies does not provide a greater accuracy of target firm value as logic suggests. The law of averages does not apply to the valuation of firms while using a multiples-based approach.

Hypothesis

1. H0: Using more than 10 comparable companies provides a greater accuracy to target firm value  
H1: Using 10 or less than 10 comparable companies provides greater accuracy to target firm value
2. H0: There is no effect of the number of companies in an industry on valuation error  
H1: There is an effect of the number of companies in an industry on valuation error

### 3.6 METHOD OF DATA COLLECTION

The data collected is completely secondary data.

The collection was done from a myriad of sources including annual reports of the companies selected as well as online financial data compiler “Ace Analyzer” as well as online repositories such as Moneycontrol.com.

All data collected is historical in nature and thus is accurate and effective in nature.

### 3.7 SAMPLING TYPE AND SIZE

As the data is of the secondary nature, there has been no sampling and the entire data has been used for the analyses carried out as per the requirements of the paper.

Sector	No. of companies	Data extracted	Sample Period	Sample Frequency
Agriculture	42	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
Cables	24	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
Cement	41	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
Chemicals	148	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
Consumer Foods	98	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
Fertilizer	30	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
Hospital and Healthcare	29	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
IT - Software	158	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
Pharmaceuticals	163	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
Plastics	178	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
Real Estate Construction	139	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
Retailing	40	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
Steel	102	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual
Sugar	38	EV/EBITDA, EBITDA, Net Sales, NI	31/3/2019 - 1/4/2020	Annual

### 3.8 STATISTICAL DESIGN

#### 1. Descriptive statistics

- A descriptive statistic provides a quick insight into different aspects of a data set and its mean, median, mode, measure of central tendency etc.
- It summarizes and measures the spread or variability of the data in question at the decided confidence level
- It helps get a quick grasp of the meaning of a large data set and helps derive useful insights from the same

#### 2. Absolute error

- It is the absolute difference between the calculated value and the “real/true” value
- In this situation it provides us insight into the accuracy of using different number of comparable and the error value derived from using each successive number of firms

#### 3. Correlation

- Correlation provides us with an insight into the effect one variable has on another and the movement of each variable in relation to a shift in another
- Correlation measures association but not causation
- A positive correlation shows movement along the same direction whereas a negative one shows movement in opposite directions
- A correlation is done to identify the movement of the accuracy of firm valuation in relation the number of firms in the selected industry

#### 4. Rank correlation

- Ranks are assigned to each of the variables identified before carrying out a correlation analysis on the given dataset

- A rank correlation helps us identify the degree of similarity between two ranks and can help the study by giving a relationship between the two
5. Regression
- Regression aids us with identifying the effect of one independent variable on another dependent variable
  - A linear regression is used to explain the effect of the number of firms of value

### 3.9 RESEARCH METHODOLOGY

- This study will identify a target firm in each sector selected for analysis and carry out a multiples-based valuation approach on said target firm
- The target firm will be valued using comparable companies ranging from the closest comparable firm to the top ten closest comparable
- The target firm will also be valued using the industry average multiple to identify if the market effect holds true in the case of peer-based valuation
- The firm value of the target estimated will be compared with the actual historical enterprise value of the company as per equity reports, annual reports as well as financial data accumulators' reports
- The error will be calculated, from which the absolute error will be ascertained, following which a rank will be assigned to the data according to the error values and their skewness from the actual historical value
- A regression study will be carried out on the cumulated error values and the number of comparable used to identify the effect of the number of comparable firms on the overall error value in relation to the target firm enterprise value
- A correlation study will be carried out to find out if there is any relation between the number of companies in the industry and the absolute error from the actual firm value to identify if the number of firms in an industry effects the accuracy of target firm value calculation
- SELECTION OF COMPARABLE COMPANY
  - The selection of the comparable firms in this study will be done in a three-fold basis, firstly with the sales value proximity, followed by sales growth historically and finally with the estimation of the net income similarity of firms in comparison to the target company.

### 3.10 LIMITATIONS OF STUDY

This study is limited in a few areas, the primary one being that valuation is a very specific procedure so may not apply to all industries. The study has aimed to minimize this bias by carrying out the analysis across 15 wide industries, but there is still scope for a detailed individual study.

The next limitation of this study is the usage of historical multiples, this was done to evaluate accurate error values, but the usage of forward-looking multiples is an area which should be considered in further studies.

The study could benefit from a deeper analysis while carrying out the selection of comparable companies, to also include non-quantitative and qualitative variables as found by other practitioner's research studies.

## 4 RESULTS AND DISCUSSION

The following section will look into the analysis of the errors and the accuracy of the usage of different number of comparable companies for the multiples-based valuation.

The following compilation table uses a multiples approach to identify firm value and identify the accuracy of this with historical enterprise value.

#### Target company value

Target company ( $t$ ) value will be identified in the following way:

$$t = \sum_{n=c}^c \frac{(m_1 + m_2 + m_3 + m_4 + \dots m_c)}{n_c} (EBITDA_t)$$

where;

$n$ : number of repetitions

$m$ : multiple of comparable company

$c$ : number of comps used for valuation

#### Error factors and error ranks

$$e = t_c - t_{\text{actual}}$$

Error ranks are assigned in an ascending order from the lowest error to the largest error value.

#### Error averages

$$\bar{e} = \sum_{n=c}^c \frac{(e_1 + e_2 + e_3 + e_4 + \dots e_c)}{n_c}$$

The error averages provide us with valuable insight into the second objective of this study; whether there is an effect of the number of firms on the firm value accuracy in the usage of multiple comparable companies.

INDUSTRY	NUMER OF COMPARABLE FIRMS USED								
	1			2			3		
	ERROR	ABS ERROR	RANK	ERROR	ABS ERROR	RANK	ERROR	ABS ERROR	RANK
Agriculture	-1.10	1.10	9	-0.42	0.42	4	-0.02	0.02	1
Cables	-12.13	12.13	3	-82.56	82.56	7	40.24	40.24	5
Cement	-5.08	5.08	8	-3.51	3.51	3	-1.60	1.60	1
Chemicals	-0.04	0.04	5	0.02	0.02	3	0.05	0.05	6
Consumer Foods	-13.41	13.41	9	-13.75	13.75	10	-6.96	6.96	5
Fertilizer	-0.38	0.38	4	-0.10	0.10	1	-0.24	0.24	2
Hospital and Healthcare	10.48	10.48	2	27.03	27.03	6	-7.91	7.91	1
IT – Software	-12.57	12.57	5	-19.43	19.43	9	-14.48	14.48	8
Pharmaceuticals	-14.01	14.01	6	-16.14	16.14	9	-17.13	17.13	10
Plastics	0.08	0.08	1	0.28	0.28	4	0.41	0.41	5
Real Estate Construction	-2.86	2.86	7	-3.39	3.39	8	-4.50	4.50	9
Retailing	23.93	23.93	3	23.97	23.97	5	24.27	24.27	6
Steel	-0.21	0.21	1	-0.29	0.29	2	-0.72	0.72	6
Sugar	-154.40	154.40	1	-423.73	423.73	6	-270.11	270.11	3

INDUSTRY	NUMER OF COMPARABLE FIRMS USED								
	4			5			6		
	ERROR	ABS ERROR	RANK	ERROR	ABS ERROR	RANK	ERROR	ABS ERROR	RANK
Agriculture	-0.77	0.77	7	-1.23	1.23	10	-0.38	0.38	3
Cables	116.54	116.54	8	13.87	13.87	4	-74.44	74.44	6
Cement	-4.03	4.03	6	-2.15	2.15	2	-6.21	6.21	9
Chemicals	0.12	0.12	8	0.01	0.01	1	-0.09	0.09	7
Consumer Foods	-9.24	9.24	7	-3.67	3.67	2	0.60	0.60	1
Fertilizer	-0.36	0.36	3	-0.49	0.49	5	-0.63	0.63	6
Hospital and Healthcare	-31.40	31.40	7	-47.50	47.50	10	-18.11	18.11	4

IT - Software	-21.43	21.43	10	-6.62	6.62	4	3.63	3.63	3
Pharmaceuticals	-14.01	14.01	6	-11.62	11.62	4	-13.72	13.72	5
Plastics	0.62	0.62	8	0.75	0.75	9	0.88	0.88	10
Real Estate Construction	-0.23	0.23	1	2.75	2.75	6	4.85	4.85	10
Retailing	24.58	24.58	8	23.25	23.25	2	24.91	24.91	9
Steel	0.48	0.48	4	1.45	1.45	8	2.12	2.12	10
Sugar	-393.80	393.80	4	-238.19	238.19	2	-411.76	411.76	5

INDUSTRY	NUMBER OF COMPARABLE FIRMS USED								
	7			8			9		
	ERROR	ABS ERROR	RANK	ERROR	ABS ERROR	RANK	ERROR	ABS ERROR	RANK
Agriculture	0.58	0.58	5	-0.66	0.66	6	0.28	0.28	2
Cables	-137.52	137.52	10	7.51	7.51	2	133.55	133.55	9
Cement	-13.72	13.72	10	-3.90	3.90	4	3.97	3.97	5
Chemicals	-0.17	0.17	10	-0.03	0.03	4	-0.14	0.14	9
Consumer Foods	-3.78	3.78	3	-7.32	7.32	6	-10.89	10.89	8
Fertilizer	-0.90	0.90	7	-1.31	1.31	9	-1.74	1.74	10
Hospital and Healthcare	10.48	10.48	3	32.29	32.29	8	59.96	59.96	11
IT - Software	-13.22	13.22	6	-0.13	0.13	1	-14.35	14.35	7
Pharmaceuticals	-9.99	9.99	2	-14.97	14.97	8	-10.51	10.51	3
Plastics	0.53	0.53	7	0.27	0.27	3	0.41	0.41	5
Real Estate Construction	1.90	1.90	4	-0.63	0.63	3	-2.71	2.71	5
Retailing	23.00	23.00	1	24.50	24.50	7	25.70	25.70	10
Steel	0.85	0.85	7	1.62	1.62	9	0.54	0.54	5
Sugar	-540.86	540.86	8	-646.67	646.67	10	-490.89	490.89	7

INDUSTRY	NUMBER OF COMPARABLE FIRMS USED	
	10	INDUSTRY AVERAGE

	ERROR	ABS ERROR	RANK	ERROR	ABS ERROR	RANK
<b>Agriculture</b>	-0.79	0.79	8	-128.45	128.45	11
<b>Cables</b>	3.04	3.04	1	-18007.62	18007.62	11
<b>Cement</b>	-4.19	4.19	7	-1671.96	1671.96	11
<b>Chemicals</b>	-0.02	0.02	2	-87.34	87.34	11
<b>Consumer Foods</b>	-4.94	4.94	4	1521.81	1521.81	11
<b>Fertilizer</b>	-1.00	1.00	8	172.39	172.39	11
<b>Hospital and Healthcare</b>	20.21	20.21	5	-45.30	45.30	9
<b>IT - Software</b>	-2.62	2.62	2	-6374.52	6374.52	11
<b>Pharmaceuticals</b>	-6.94	6.94	1	-124.36	124.36	11
<b>Plastics</b>	0.21	0.21	2	31.50	31.50	11
<b>Real Estate Construction</b>	-0.27	0.27	2	1385.02	1385.02	11
<b>Retailing</b>	23.93	23.93	4	789.95	789.95	11
<b>Steel</b>	-0.48	0.48	3	59.65	59.65	11
<b>Sugar</b>	-609.26	609.26	9	17980.15	17980.15	11

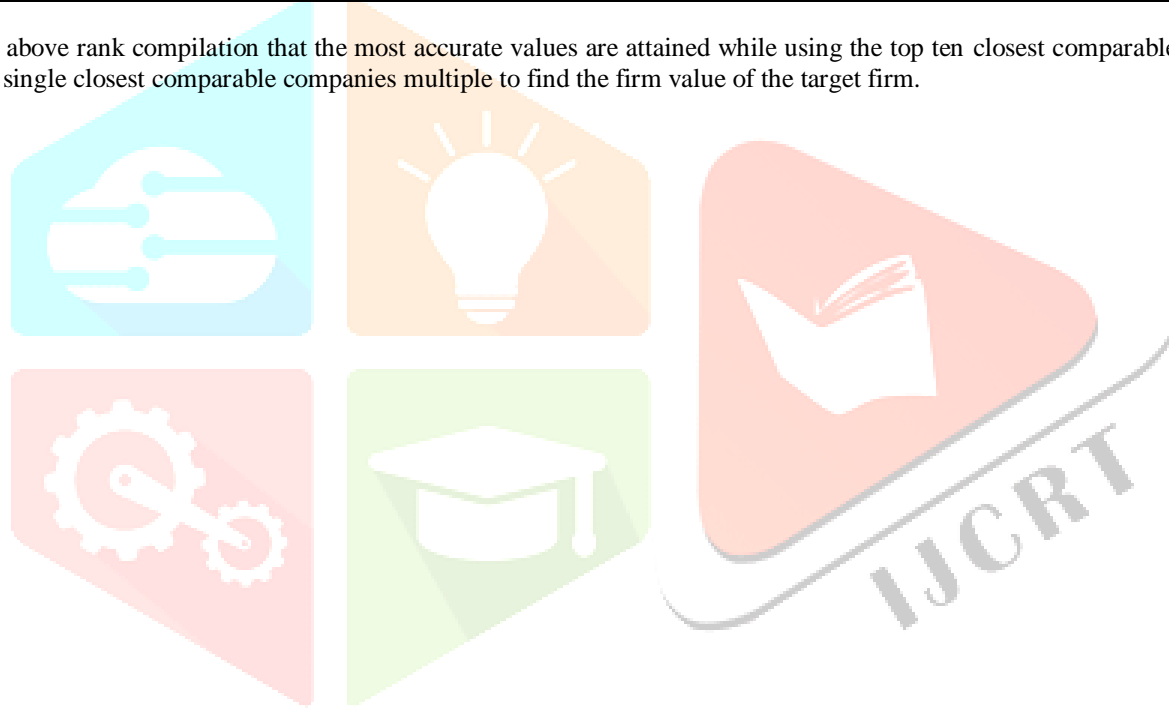
The above tables provide the error statistics identified and valued post valuation of the target company in each of the 14 sectors chosen, the error values, absolute error and ranks are provided above. From which we can see that there is a clear trend of maximum errors while using an industry average multiple for the valuation of the target company and there is a trend of maximum accuracy while either using the closest comparable or while using the ten closest comparable company's average multiples for the firm valuation process.

INDUSTRY	NUMBER OF COMPARABLE FIRMS - RANK OF SIMILARITY TO ACTUAL ENTERPRISE VALUE										
	1	2	3	4	5	6	7	8	9	10	IND AVG
Agriculture	9	4	1	7	10	3	5	6	2	8	11
Cables	3	7	5	8	4	6	10	2	9	1	11
Cement	8	3	1	6	2	9	10	4	5	7	11
Chemicals	5	3	6	8	1	7	10	4	9	2	11
Consumer Foods	9	10	5	7	2	1	3	6	8	4	11
Fertilizer	4	1	2	3	5	6	7	9	10	8	11
Hospital and Healthcare	2	6	1	7	10	4	3	8	11	5	9
IT - Software	5	9	8	10	4	3	6	1	7	2	11



Pharmaceuticals	6	9	10	6	4	5	2	8	3	1	11
Plastics	1	4	5	8	9	10	7	3	5	2	11
Real Estate Construction	7	8	9	1	6	10	4	3	5	2	11
Retailing	3	5	6	8	2	9	1	7	10	4	11
Steel	1	2	6	4	8	10	7	9	5	3	11
Sugar	1	6	3	4	2	5	8	10	7	9	11
MEAN	4.57	5.50	4.86	6.21	4.93	6.29	5.93	5.71	6.86	4.14	10.86
<b>OVERALL RANK</b>	<b>2</b>	<b>5</b>	<b>3</b>	<b>8</b>	<b>4</b>	<b>9</b>	<b>7</b>	<b>6</b>	<b>10</b>	<b>1</b>	<b>11</b>

We can note from the above rank compilation that the most accurate values are attained while using the top ten closest comparable companies average multiple, followed by using the single closest comparable companies multiple to find the firm value of the target firm.



Error average		
INDUSTRY	NUMBER OF FIRMS IN THE INDUSTRY	AVERAGE OF ERRORS
Agriculture	42	12.24
Cables	24	1693.55
Cement	41	156.39
Chemicals	148	8.00
Consumer Foods	98	145.12
Fertilizer	30	16.32
Hospital and Healthcare	29	28.24
IT - Software	158	589.36
Pharmaceuticals	163	23.04
Plastics	178	3.27
Real Estate Construction	139	128.10
Retailing	40	93.82
Steel	102	6.22
Sugar	38	2014.53

	NUMBER OF FIRMS IN THE INDUSTRY	AVERAGE OF ERRORS
NUMBER OF FIRMS IN THE INDUSTRY	1	
AVERAGE OF ERRORS	-0.340568	1

From the above correlation analysis, we can see a negative correlation between the number of firms in the industry and the average of errors of firm value in comparison to true value. There is a negative relationship between the number of firms the industry and the error factor. The more the number of firms in the industry, the lesser the error value of firm value as per calculations. This shows that an industry where there are numerous companies can be used to calculate the firm value using the industry average. In those industries where the number of firms is low, the usage of industry average multiples does not lead to an accurate value.

INDUSTRY		Coefficient <i>s</i>	Standard Error	<i>t Stat</i>	<i>P-value</i>	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Agriculture	Intercept	16.83526	4.06312	4.14343	0.00251	7.64385	26.02667	7.64385	26.02667
	Comps	3.27963	0.29069	-11.28203	0.00000	-3.93723	-2.62203	-3.93723	-2.62203
Cables	Intercept	-987.858	320.7743	-3.0796	0.013148	-1713.5	-262.216	-1713.5	-262.216
	Comps	196.2492	35.19029	5.576801	0.000344	116.6433	275.8552	116.6433	275.8552
Cement	Intercept	-58.28	12.8747	-4.5267	0.001433	-87.4045	-29.1553	-87.4045	-29.1553
	Comps	10.3192	0.978075	10.55056	2.29E-06	8.106677	12.5318	8.106677	12.5318
Chemicals	Intercept	0.88429	0.15610	5.66504	0.00031	0.53118	1.23741	0.53118	1.23741
	Comps	0.16773	0.00347	-48.36904	0.00000	-0.17557	-0.15989	-0.17557	-0.15989
Consumer Foods	Intercept	-95.94775	16.26675	-5.89840	0.00023	-132.74568	-59.14981	-132.74568	-59.14981
	Comps	16.36510	0.53980	30.31675	0.00000	15.14398	17.58622	15.14398	17.58622
Fertilizer	Intercept	-34.03686	9.67247	-3.51894	0.00653	-55.91752	-12.15621	-55.91752	-12.15621
	Comps	6.50168	0.93827	6.92945	0.00007	4.37917	8.62419	4.37917	8.62419
Hospital and Healthcare	Intercept	9.64916	12.50276	0.77176	0.46004	-18.63404	37.93237	-18.63404	37.93237
	Comps	0.91358	0.77202	-1.18336	0.26698	-2.66001	0.83285	-2.66001	0.83285
IT - Software	Intercept	216.16578	43.01704	5.02512	0.00071	118.85448	313.47709	118.85448	313.47709
	Comps	41.56606	0.89610	-46.38552	0.00000	-43.59318	-39.53894	-43.59318	-39.53894
Pharmaceuticals	Intercept	-56.82528	7.32422	-7.75854	0.00003	-73.39381	-40.25674	-73.39381	-40.25674
	Comps	8.05534	0.14796	54.44243	0.00000	7.72063	8.39005	7.72063	8.39005
Plastics	Intercept	-7.35260	1.41721	-5.18809	0.00057	-10.55854	-4.14666	-10.55854	-4.14666
	Comps	1.43013	0.02639	54.18405	0.00000	1.37042	1.48984	1.37042	1.48984
Real Estate Construction	Intercept	-57.10789	10.18041	-5.60959	0.00033	-80.13758	-34.07820	-80.13758	-34.07820
	Comps	10.40480	0.24223	42.95337	0.00000	9.85683	10.95277	9.85683	10.95277
Retailing	Intercept	84.32930	25.42949	-3.31620	0.00899	-141.85480	-26.80380	-141.85480	-26.80380
	Comps	20.62760	1.89301	10.89670	0.00000	16.34531	24.90989	16.34531	24.90989
Steel	Intercept	21.80319	4.16639	5.23311	0.00054	12.37815	31.22822	12.37815	31.22822
	Comps	3.92955	0.13304	-29.53770	0.00000	-4.23049	-3.62860	-4.23049	-3.62860
Sugar	Intercept	3260.63945	758.53507	-4.29860	0.00199	4976.56499	1544.71391	4976.56499	1544.71391
	Comps	545.79701	61.36040	8.89494	0.00001	406.99015	684.60387	406.99015	684.60387

INDUSTRY	Significance value	R - squared value	Coefficient value
Agriculture	0.0000013000	0.9339615706	3.2796304209
Cables	0.0003892126	0.7695324099	192.9912
Cement	0.0000023368	0.9248362866	46.05656015
Chemicals	0.0000000000	0.9961678713	0.1677301035
Consumer Foods	0.0000000002	0.9903028258	16.3651018348
Fertilizer	0.0000683894	0.8421531436	6.5016788198
Hospital and Healthcare	0.2669795405	0.1346443040	0.9135813427
IT - Software	0.0000000000	0.9958345220	41.5660609182
Pharmaceuticals	0.0000000000	0.9969727329	8.0553361976
Plastics	0.0000000000	0.9969438808	1.4301289753
Real Estate Construction	0.0000000000	0.9951456111	10.4047982335
Retailing	0.0000017432	0.9295433254	20.6276003849
Steel	0.0000000003	0.9897898493	3.9295484712
Sugar	0.0000093979	0.8978664866	545.7970077130
<b>AVERAGE</b>	<b>0.0000363</b>	<b>0.89</b>	<b>64.14900</b>

We can see from the regression analysis for each company (appendix1) as well as the complied sheet that p-values or significance values are under 0.05 for all the industry regression analyses, providing us a high level of confidence regarding the significance of the regression analysis and also provide us strong confidence in the accuracy of the output of the regression analysis.

We can see from the R-Squared values that there is a very large effect of the number of comparable firms used on the target firm value. There is a range of the value, but the average is 0.89, or 0.9 showing a 90% effect of the number of comparable firms on the value of the target firm. This can provide us with a high degree of confidence regarding the regression analysis and its output regarding the relation and direction of relation of the two variables, as the r-squared value is in excess of 0.7.

We can see from the regression analysis that there is a positive relationship which exists between the two variables, which means with an increase in the number of comparable firms, and with the inclusion of the overall industry average multiple, the error increases as well.

Regression coefficient with and without usage of industry average in the multiples valuation

## 5 SUMMARY OF FINDINGS

This study was conducted with the aim of identifying answers for two aspects of the multiples-based valuation process and help understand the situation of the valuation process in detail.

Regression Statistics	
Multiple R	0.340568
R Square	0.115986563
Adjusted R Square	0.042318776
Standard Error	643.3582483
Correlation coefficient	-0.340568
P-value	0.049424636
Coefficients - No. of firms in the industry	-3.797418785
Observations	14

Regarding the objective of wheatear there is an effect of the number of firms in an industry on the valuation of a target firm while using industry multiples, we can see from the consolidated valuation, regression, correlation and error sampling techniques that, there the analysis is significant given the p-value is equal to 0.05. We can thus see that H1 is accepted as the p-value is lower than 0.05. We can see a negative relationship between the chosen variables, meaning with an increase in the number of companies in an industry, we see a reduction in the error of firm value while using industry multiples. This is because there is a better balance of all aspects of the industry when there are more firms of different sizes, growth rates, financial positions and expectations. The correlation shows that there is negative 34% relationship between the number of firms in the industry and the error value.

This is in line with theory and market observations, the null hypothesis is rejected and we can confirm that as per logic as well as technical analysis carried out, there is an effect of the number of firms on the overall accuracy of target firm value calculation in the use of average industry multiples.

Further, the main objective of this study was to identify the optimal number of comparable firms to be used or the most optimal range of number of comparable firms to be used to attain the most accurate target firm value while using an average of the comparable firms' valuation multiples. This part of the study was characterized by two hypotheses, the null hypothesis being that using more than 10 comparable companies provides a greater accuracy to target firm value, whereas hypothesis one was that using 10 or less than 10 comparable companies provides greater accuracy to target firm value. After carrying out the analysis we can draw the following conclusions.

INDUSTRY	SIGNIFICANCE VALUE	R - SQUARED VALUE	COEFFICIENT VALUE
Agriculture	0.0000013000	0.9339615706	3.2796304209
Cables	0.0003892126	0.7695324099	192.9912000000
Cement	0.0000023368	0.9248362866	46.0565601500
Chemicals	0.0000000000	0.9961678713	0.1677301035
Consumer Foods	0.0000000002	0.9903028258	16.3651018348
Fertilizer	0.0000683894	0.8421531436	6.5016788198
Hospital and Healthcare	0.2669795405	0.1346443040	0.9135813427
IT - Software	0.0000000000	0.9958345220	41.5660609182
Pharmaceuticals	0.0000000000	0.9969727329	8.0553361976
Plastics	0.0000000000	0.9969438808	1.4301289753
Real Estate Construction	0.0000000000	0.9951456111	10.4047982335
Retailing	0.0000017432	0.9295433254	20.6276003849
Steel	0.0000000003	0.9897898493	3.9295484712
Sugar	0.0000093979	0.8978664866	545.7970077130
<b>AVERAGE</b>	<b>0.0000363</b>	<b>0.9</b>	<b>64.14900</b>

We can firstly see that since the significance value is a lower than 0.05, the data is significant and the analysis holds true. We also reject H<sub>0</sub> as the p-value is less than 0.05. From the regression coefficients we can draw a conclusion that the variables are positively related to one another. With an increase in the number of comparable companies being used, the error in the value increases. This is majorly due to the fact that there is a large error being found while using the industry average multiple to find firm value. The usage of the closest firms of the industry is the most optimal process in company valuation of any target company. We can see from the r-squared value that the number of comparable firms being used has an effect on the firm value up to 90% making it one of the most important aspects of a multiples-based valuation process.

The comparable companies used in this paper for the calculation of target firm value is decided based on a three-fold approach by identifying those companies with the closest sales figures, historical growth values as well as net income. Identifying comparable firms with a more detailed approach will only make the accuracy happen with the closest comparable or the two to five closest comparable firm's average multiple.

INDUSTRY	NUMBER OF COMPARABLE FIRMS - RANK OF SIMILARITY TO ACTUAL ENTERPRISE VALUE										IND AVG
	1	2	3	4	5	6	7	8	9	10	
Agriculture	9	4	1	7	10	3	5	6	2	8	11
Cables	3	7	5	8	4	6	10	2	9	1	11
Cement	8	3	1	6	2	9	10	4	5	7	11
Chemicals	5	3	6	8	1	7	10	4	9	2	11
Consumer Foods	9	10	5	7	2	1	3	6	8	4	11
Fertilizer	4	1	2	3	5	6	7	9	10	8	11
Hospital and Healthcare	2	6	1	7	10	4	3	8	11	5	9
IT - Software	5	9	8	10	4	3	6	1	7	2	11
Pharmaceuticals	6	9	10	6	4	5	2	8	3	1	11
Plastics	1	4	5	8	9	10	7	3	5	2	11
Real Estate Construction	7	8	9	1	6	10	4	3	5	2	11
Retailing	3	5	6	8	2	9	1	7	10	4	11
Steel	1	2	6	4	8	10	7	9	5	3	11
Sugar	1	6	3	4	2	5	8	10	7	9	11
MEAN	4.57	5.50	4.86	6.21	4.93	6.29	5.93	5.71	6.86	4.14	10.86
<b>OVERALL RANK</b>	<b>2</b>	<b>5</b>	<b>3</b>	<b>8</b>	<b>4</b>	<b>9</b>	<b>7</b>	<b>6</b>	<b>10</b>	<b>1</b>	<b>11</b>

The consolidated absolute error and accuracy factor sheet provides us a detailed and deeper insight into the most optimal number of firms to be used to value a target firm using the valuation multiple average. We can see that through this analysis, the best number of comparable to be used is 10, but this again is a situation in the given industries. When we carry out a covariance analysis on this data, we can see that the error increases when we increase the number of firms in the comparable companies. This is corroborated by the fact that the second, third, fourth and fifth most accurate firm values are attained by using comparable firms lesser than 5. Thus, we can safely conclude that the usage H<sub>1</sub>, which states that the usage of 10 or less than 10 comparable firms provides us with the most accurate target firm value. With the analysis of the consolidated accuracy rank sheet, we can conclude that using comparable firms between 1 and 5 will derive the most optimal and closest firm value to reality.

Firm value = 3.3273 + 0.4455 \* (Comparable firms average)

## 6 RECOMMENDATIONS

This study was conducted with the objective of helping understand certain fundamental aspects of a multiples or peer-based valuation process. This was to ensure that target firm valuation could be done in an accurate manner and minimize the biases and errors which may occur in any step of the valuation process, be it the selection of comparable companies, selecting the number of comparable companies or also the usage of multiple. This study specifically aimed to provide an answer to the question regarding the optimal number of comparable companies that should be used to maximize the accuracy of a multiples based or relative valuation.

The analysis conducted points to certain outputs which can be employed by practitioners, firstly the study found that in case a valuer wishes to utilize an industry average multiple for the valuation process of the target company they have chosen, it would be beneficial for them to do the same in those industries where there are a large number of companies. Industries with a small number of firms leads to a larger error possibility in the target firm value due to inability of the industry average to discount for all types of firms and company perspectives.

The next main conclusion of this paper was the most important one, the question regarding the optimal number of comparable firms or “comps” to be used to ensure the most accurate target firm value while carrying out a relative valuation procedure. The study after extensive analysis concludes that the most optimal number of firms to be used are in the range of a single closest comparable to the top five most comparable firms, making a range of 1-5 “comps” most reliable and accurate for a relative valuation process. The usage of the average multiple of this number of firms most consistently provides an output with minimized error. Though, it must be noted that, at first glance, even the usage of ten comparable firms provides a good deal of accuracy, but this is rejected through the analysis carried out which states that absolute error only increases with the increase in the number of comparable firms used.

Thus, we can conclude that using 1-5 comparable firms to find a target firms value will maximize the accuracy and in case the valuer wishes to use the industry average multiple, it would be safer to do so when there are a large number of firms in the industry in question.

## 7 CONCLUSION

This paper sought out to answer a major question of the relative valuation process and has done through detailed analysis which was data driven and technically backed. The field of relative valuation is one which is a balancing act of both art and science, as is valuation as a whole. There are formula and strict rules which can help a valuer maximize accuracy, but there is also the aspect of ability, experience and the knowledge of the markets which help with the valuation accuracy which cannot be taught or explained, but can only be accumulated through years of valuing companies and understanding the economy. This paper aimed to answer in small part the scientific aspect of the relative valuation process by providing an initial direction that valuers may utilize to begin their valuation process before making their models more targeted and accurate given their individual and unique situation. This paper must not be taken in a vacuum and must be combined with other processes and intellectual property in regard to the valuation process to attain accuracy of values.

The valuation process is one of high technicality and complexity, and any initial direction to aid in the preliminary processes of valuation can be helpful to a desired extent.

The author hopes to have carried out his responsibility in aiding the understanding of this process and confirms that the material facts in this study are accurate and truthful to his knowledge and skill set.

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