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# Analysis of Determinants of Debt Financing: A Case study of the Cement Industry of Pakistan

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**ABSTRACT**

*The aim of this study is to an analysis of Determinants of Debt Financing: A Case study of the Cement Industry of Pakistan. As Profitability is one of the best tools to measure the performance of any firm or sector. The current study also aims to analyze the impact of intangible assets on the profitability of the cement industry of Pakistan. To analyze the impact of intangible assets on profitability some control variables are also used in this research i.e. capital structure, firm size, growth rate, non-debt tax shield, and working capital, alongside these variables intangible assets are also used as a determinant of the profitability and age of the firm is used as a moderator between intangible assets and the profitability of the firm. The Data collected Twenty years of (unbalanced) annual data i.e. 1998 to 2017 of twenty cement companies listed under the Pakistan stock exchange is used and the data sources are secondary. To analyze the data panel data regression is used, the results of the study concluded that a positive and significant relationship exists between intangibles and profitability, and the age of the firm moderated the relationship between the two variables. Firms in Pakistan should report intangible assets in their financial statements, the managers of the said industry need to manage the intangible assets of their firm efficiently and should work on its disclosure in their financial statements.*



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## 1. Introduction

Dynamic environment, where human resources, technology, and research and development play a vital role on the performance of the firms, the firms should report all these important resources as intangible assets in their financial statements (Sanchez, P., Chaminade, C., & Olea, M., 2000). The financial statements generated by the firms are not as much information to prospects as they should because they do not include some relevant information that should be mentioned in the financial

statements, which is the main reason for the increase in the gap between the market value and book value of the equity in financial markets. The controversy among the academic community that whether or not intangible assets should be included in financial statements or not. The reason behind this might be the definition of intangibles, different methods of the measurement of intangibles, and how they should be amortized.

According to IAS 38 defines as intangible assets as non-monetary assets that cannot be used in the production or supply of services and goods. While White and Fried (1994) explained ASB considers intangible assets as part of goodwill to enable them to be sold without selling the whole firm or business. Talking about IAS 38, it deals specifically with recognizing and measuring intangible assets and their reporting. The said standard requires the firm to report the intangible assets if certain criteria are met. IAS 38 also tell us about the measurement of the intangible assets and also requires some disclosures regarding intangible assets [IAS 38.1]. The most recent amendment made by IFRS in IAS 38 was in 2014 effective form January 1st 2016.

The significant of the intangible assets and their reporting as per the standards issued by IFRS, in this study we analyze the impact of these intangible assets on the profitability of the cement industry of Pakistan. The cement industry of Pakistan plays a vital role in the development of the economy of Pakistan and also one of the most important sector for the economy of Pakistan. The positive impact of cement industry of Pakistan is not only important for the manufacturing sector of the country but also for the growth and development of the country. The human capital of Pakistan is 3% employed in cement industry of Pakistan (Najabat, 2015). The cement industry of Pakistan was once a very small industry but it rapidly grew with the passage of time and finally in 2001 it entered in the export market (Najabat, 2015).

In recent past the topic of profitability has been given a notable importance. The current study is focused to analyze the factors that affect profitability in cement industry of Pakistan. Many researches have been conducted to find the factors that affect the profitability and came up with contradictory results. In the same way many studies have been conducted in Pakistan on the profitability of different industries and sectors, but the variable of intangible assets has not been included in any research to determine profitability. The current study is conducted to answer the questions that are intangible assets an important variable to determine the profitability of the cement companies of Pakistan? And does age of the firm moderate the relationship between the two variables? And to what extent does the selected variable impact the profitability? With the controlling effects of capital structure, firm size, non-debt tax shield, Growth rate and working capital.

**2. Problem statement**

As per the above rationale and discussion, the problem is that the researchers and the managers have considered capital structure, firm size, growth rate, working capital and non-debt tax shield as a standard determinant of profitability. Whereas recent exploratory studies have highlighted 'intangible assets' as an important and significant variable to determine profitability. According to Sanchez, P., Chaminade, C., & Olea, M. (2000) that firms in Pakistan are not reporting intangible assets in their financial statements, leading to an increase in gap between market value and book value of equity due to incomplete disclosure of financial position. Cement industry of Pakistan is essential for Pakistan's economic development, with 3% of its human capital employed in it (Najabat, 2015). Because of the strategic importance of this industry to the country the study aims to analyze the impact of intangible assets on the profitability of the cement industry of the country to answer our question that are intangible assets worth reporting? Beside this, many firms in the recent past started to report their

intangible assets in their balance sheets, but still many firms failed to disclose their intangibles in their financial statements.

**3. Research Contribution**

Most of studies on profitability have been undertaken utilizing data from various nations and sectors, as well as various independent factors. So far, as per knowledge, this kind of research has not been conducted in Pakistan in which intangible assets, as a determinant of profitability in cement industry of Pakistan has been used and the moderating effect of age of the firm is analyzed between intangible assets and the profitability. Therefore, this study attempts to investigate the importance of intangible assets and its impact on profitability and help researchers to better understand the determinants of profitability and the role of intangible assets.

**4. Research Questions**

- Is intangible assets an important variable to determine the profitability of cement industry?
- Does age of the firm moderates the relationship between intangible assets and the profitability?
- To what extent does the determinants understudy affect the profitability of cement industry?

**5. Research objectives**

- To explore the importance of intangible assets as a determinant to measure the profitability of cement industry.
- To understand and highlight the overall impact of the selected variable on the performance of the cement industry.
- To examine the moderating effect of age of the firm between intangible assets and the profitability.

**6. Profile of cement industry of Pakistan**

The cement industry of Pakistan has grown to meet the demands of the country, with 21 cement companies listed under Pakistan stock exchange and multinational firms. The production cost of the cement is approximately 50% to 60% of the cost of goods sold. Cement industry plays a key role in the development of the economy of Pakistan as the inputs required for this industry are cheaply and abundantly available in Pakistan (Najabat, 2015). As per Najabat (2015), (Khan M, Anadil, et al., 2012) conducted a research to examine the role of cement industry on the economy of Pakistan. The results of their study revealed that the abundance and availability of the raw material required motivate the cement manufacturers in Pakistan. Khalid Kamran (2008) also conducted a research to analyze the performance of the cement sector of Pakistan. He concluded that after the earthquake of 8$^{th}$ of October 2005 the demand and supply for cement has increased greatly because of reconstruction projects.

**7. Why cement industry of Pakistan?**

According to Bloomberg report (2017), after the introduction of CPEC the cement industry of Pakistan is expected to increase its production capacity to meet the demands of the economy, the expected increase is about 56% to 70 million tons in next 5 years. The capacity to utilize cement has also shown an increase of about 88% in 10 months (which is highest in last 11 years). Beside this, because of an increase demand of cement in Pakistani market the exports of the cement also declined by almost 19% as per APCMA (All Pakistan cement manufacturer association). Beside this report of Bloomberg, BMI Research Company also published a report in 2017 and ranked Pakistan among the fastest growing construction markets in the world, with an expected growth rate of 12% annually. So, keeping in mind the increased importance of the cement industry for the economy of Pakistan and the importance of intangible assets to any industry, the said industry is being selected.

In the current study data of twenty cement companies operating in Pakistan and listed under Karachi stock Exchange has been used. The cement companies under the study are mentioned in Table 1.0 along with their PSX symbols. The dependent variable of this research is profitability as Schendel and Hofer (1979) argued in their research that profitability is one of the better representative of performance as compared to the others.

## 8. Literature review

### 8.1 Profitability

A company's profitability is the amount by which its total income exceeds its total costs during a particular period. Profitability is an accounting term that is sometimes known as net profit or net income. Accounting policies can have an impact on how income statements, also known as statements of operations, portray income and costs in financial reporting. Corporations utilize accounting procedures to take advantage of tax restrictions and decrease their tax liability. The main objective of firms is to produce profits and enhance their profitability and to make sure that business will sustain in market conditions. Pandey (1980) characterized the capacity of being profitable as an important variable in order to ensure survival in market conditions. To enhance the profitability of the firms it's important to look at the factors that affect the profitability and to understand how companies fund their operations. The Profitability is the capacity to generate profits and handle future uncertainty, and it is the best measure of performance (Schendel & Hofer, 1979). Further Kartz & Shapiro (1994) expressed in their study that firms can increase their profitability by cost cutting or by improving their market position.

### 8.2 Capital structure and Theories

Capital structure is the mix of debt and equity used to finance a company's assets and operations. The discussion on the topic of capital structure was initially started by (Franco Modigliani; Merton H. Miller, 1958). They analyzed the impact of Agency costs, bankruptcy costs and taxation on capital structure. Many theories have been presented on the capital of capital structure four contradictory theories from those theories are the irrelevance theory (Franco Modigliani; Merton H. Miller, 1958) the tradeoff theory (Bradley et al., 1984) pecking order theory (Jensen, 1986) and agency cost theory (Myers, S. C., & Majluf, N. S., 1984) After the foundation set by Modigliani and Miller's theory these four opposing theories were presented. The pecking order theory presented by (Jensen, 1986) predicts an existence of negative relationship between capital structure and profitability, while on the other hand the Tradeoff theory and agency cost theory said that there exists a positive relationship between the two variables. Before discussing these theories of capital structure have a look at the assumptions of these theories.

1. Debt and equity are the only two sources that firms use for financing
2. No change in the investment decisions of the firm i.e. no change in total assets
3. 100% dividend payout ratio or no retained earnings
4. Financing mix has no impact on business risk
5. Investors expect future profitability of the firm

#### 8.2.1 MM theory

(Franco Modigliani; Merton H. Miller, 1958) were the first ones to introduce the modern theory on capital structure which is considered as the base of current corporate finance. Theory based on the two different propositions under certain assumptions. Both the propositions consider that market is perfect, there is no bankruptcy cost, no transaction cost, and no symmetry information and no tax rate.

**Proposition I:** The proposition I states that the value of firm is not dependent on its capital structure, which means in what manner the capital structure is designed the value of the firm will not be affected or we can say that the value of firm with leverage and the value of firm without leverage is same.

**Proposition II:** states that as the level of leverage rises the cost of equity of the firm also rises while WACC remains the same as higher cost of equity compensate low cost of the debt. In 1963 Modigliani and Miller removed the assumption of corporate tax rate from their propositions while keeping the other assumptions same and stated that as the level of financial leverage increases the value of firm also increase and the reason behind this increase in value is that the firm will get a debt shield because of debt. Beside this as the level of leverage rises in the capital structure of the firm the weighted average cost of capital decreases.

### 8.2.2 Pecking order theory

Myers, S. C., & Majluf, N. S. (1984) presented that the Pecking Order Theory suggests that asymmetry of information between insiders and outsiders affects capital structure, leading to higher costs of financing. Further Myers, S. C. (1984) stated that there is no standard structure for managers to design capital structure of the firms, firms chose their financing sources in hierarchical order i.e. managers prefer internal finance at first place, then debt and use equity as last resort.

### 8.2.3 Market timing theory

Presented by Baker, M., & Wurgler, J. (2002) the theory says that the existing capital structure of a company is a result of the past attempts of the firm to time the equity market. Companies try to issue new shares in the market when they perceive that their firm is overvalued and when they perceive that their shares are undervalued they purchase them back, and as a result their capital is related to the historical market values.

### 8.2.4 Trade-off theory

DeAngelo & Masulis (1980) presented the trade-off theory of capital structure. The theory states that the advantages and disadvantages of debt financing decides the optimal capital structure of a firm or debt to equity ratio is the optimal capital structure, the benefits that a debt provides compensate the financial distress created by marginal debt. The advantages of debt include the tax shield and the reduction of agency costs between managers and shareholders and the disadvantages include increase of bankruptcy cost as the level of leverage increase in the capital structure of the firm. In accordance to the trade-off theory firms generating good profits should use more debt to in their capital structure to have a tax shield on their income. In other words, trade-off theory predicts the relation between leverage and capital structure as positive.

### 8.2.5 Free cash flow theory

Free cash flow theory was presented by Jensen, M. C. (1986) that free cash flow theory states that the value of a firm increases, when the cash flows are positive and exceed profitable investment opportunities. Beside this firms generating positive free cash flows try to reduce the level of debt ratio while on the other hand firms with negative cash flows obtain more debt from the market and responds to the lack of availability of internal funds and this percentage of adjustment of debt is getting smaller if the firm has already high level of debt in its capital structure and vice versa.

### 8.2.6 Agency cost theory

Jensen & Meckling (1976) are the first ones to introduce the concept of agency costs. According

to agency cost theory firms holding substantial amount of debt face an agency relationship between creditors and shareholders of the firm. In such cases firms pay a little incentive to its shareholders to limit the loss in the event of bankruptcy. In the other words we can say that agency cost theory suggest that there exists a conflict of interest between the shareholders and the managers of the firms. Managers make the decisions about the capital structure of the firm, that capital structure which is optimal in view of managers can be suboptimal in view of shareholders which creates conflict between them. The theory states that however in some way by managerial equity investment, compensation contracts and monitoring by board of directors and some major shareholders can reduce this conflict of interest (Mehran, H., 1992).

### 8.3 Working Capital

Sagan (1995) was the first person to write the theoretical paper on working capital and focused on how to manage working capital and emphasize on the necessity to develop a theory on working capital. To maintain a balance between short term assets and liabilities is one of the most important part of the working capital management, beside this the core objective of working capital management is to make sure that a firm can smoothly maintain its operational expenses and also have capacity of meet the upcoming short term debt and developing operational costs (Velnampy, 2005). When it comes to the relationship between working capital and profitability many studies came out with contradictory results. Padachi, K. (2006) results of the study concluded that firms with high investment on account receivables and inventories tend to become less profitable as compared to the firms with less investment in inventories and receivables. He also noted as the level of cash conversion cycle reduces the profitability of the firm increases.

### 8.4 Firm Size

Velnampy & Nimalathasan (2010) conducted research to find the relationship between firm size and profitability they used the data of Bank of Ceylon and commercial Bank of Ceylon in Srilanka for the period of 1997 to 2006. They used correlation analysis, in the results of their study they found that positive and statistically significant relationship exists between firm size and profitability in case of commercial Bank of Ceylon while on the other hand there exist no significant relationship between the firm size and profitability of Bank of Ceylon. Demsetz, H. (1973) came up with something different on the relationship between firm size and profitability and suggest that there is no relationship between the traditional scale economies and the prominent profits of large firms. He used the internal revenue information data to analyze the relationship and finds that in developed markets large firms earn higher profits while small firms generate low profits. Theory of Marginal utility expansion suggests us results contrary to the results of Demsetz, H. (1973) and suggests that a negative relationship exist between the size of firm and its profitability. Amato & Wilder (1985) used the data of US firms for the period of 1945 to 1980 in their research and examined both cubic and linear form of relationship. Profits of the firms increase with the size of the firm and small firms generate less profit as compared to large firms. Ammar et al. (2003) used the data of firms for the electrical contractors for the period of 1985 to 1996 and applied first order autoregressive model on the data to measure the relationship between the two variables. The results of their study came up with positive and significant results Marcus (1969) used the data of firms operating in US for the period of 1959 to 1962 and gathered data from internal revenue services, he applied regression analysis on the data and suggest that there exists no relationship between the two variables. A positive relationship can be expected between the two terms when a large firm have an edge over the economies of scale on small firms, but when the management of the firm struggle to earn maximum profits to increase the size of the business than firms become large in size. While in case of small firms, when these small firms look for non-monetary benefits instead of monetary benefits than in this case they earn low profitability.

### 8.5 Growth rate

Trau, F. (1996) and Hart, P.E. (2000) conducted researches on the relationship of growth rate and profitability by using the financial data of manufacturing firms operating in Europe. They found weak positive relationship between the two variables and in some cases found no relationship. MacMillan, I. C., & Day, D. L. (1987) in their research concluded that firms with faster growth tend to be more profitable as compared to the firms with low level of growth and the new firms that enters into the market rapidly tends to be more profitable on large scale. Small firms' growth is the most important variable to impact profitability, but finance related problems are also important. New firms are found to be quicker than older ones and larger firms found to be faster than smaller ones. Jang, S. S., & Park, K. (2011) analyzed the relationship between firm size, firm growth and profitability and found that firm size impact the profitability of firms, but the growth of the firm has more impact.

### 8.6 Non-debt Tax shield

Deangelo & Masulis (1980) argued that firms tend to have higher level of non-debt tax shield can be relied upon to utilize less debt as they can use non debt tax shield as a proxy or substitute of tax shield from debt financing. Shah & Khan (2007) in their research revealed profitability has a negative relationship with leverage while non-debt tax shield has a positive relationship with profitability. They used the data of 7 oil and gas firms listed under Karachi stock exchange for the period of 2001 to 2005, and applied Panel data regression with fixed effects model. Tax shields on debts provides enough reason to the managers of the firms to increase the level of leverage to avoid taxes but on the other hand non debt tax shield provide managers same benefit that reduces the level of taxes because of depreciation and investment tax credits also plays an important role to affect leverage Modigliani & Miller (1958). Titman & Wessels (1998) conducted a research to find the impact of non-debt tax shield on profitability they used the ratio of tax credits and divided it by total assets and the ratio of depreciation over total assets to measure the depreciation. They used the data of 6,842 non-financial Spanish firms for the period of 1994 to 1998 and used Panel data to analyze the data and came up with positive results. Sivathaasan & Hanitha (2013) conducted a research to find the impact of non-debt tax shield on profitability; they used the data of Colombo stock exchange and used 287 firms from 20 different sectors as their sample. Using panel data regression with fixed effects model the results of the study concluded that the relationship between non-debt tax shield and profitability is positive and statistically significant.

### 8.7 Intangible assets

There are some type of assets that cannot be included in any financial statement not because they are not important for the firm to include them in financial statements but because it's not easy to quantify those assets in terms of money such assets are called intangible assets, intellectual capital is also a part of intangible assets that can help a firm to improve its competitive position in the market (Marr & Schiuma, 2011). Edvinsson & Malone (1997) explained the valuation of intangible assets as the difference between book value and market value of the firm while on the other hand Kok, A. (2007) disagree with this method that comparing two values of the company is not a viable methodology to compute the value of intangible assets. Pena, I. (2002) concluded that firms that focus on the development and management of their intangible assets perform better as compared to firms who don't care much about their intangible assets. Beside this Garger, J. (2010) added that the volatility in the value of tangible assets is less as compared to intangible assets which makes the increase or decrease between the difference of book value and market value more volatile. If firms make right decisions about their human capital and how utilize their resources efficiently and able to align them with their objectives and strategies they can boost their profits and market value by great margin (Behname.M,

Pajoohi M.R et al., 2012).

### 8.8 Age of the firm

Different researches concluded different results regarding the impact of the age of the firm on its performance and profitability. Past researches can be grouped into three categories with regard to their results. One group of researchers suggest that older firms are more profitable because of their experience and they also enjoy the benefits of learning by doing (Coad et al. 2013, Vassilakis 2008). Beside this, the rate of failure is high in young firms because they are inclined to liabilities of newness, because of poorly understood factors (Stinchcombe, 1965). The second category of the literature believes that as the age of the firm increases its performance also increases, and the reason behind this increase in performance might be the selection effects, which is result from the forced exit of less productive firms (Jovanovic, 1982). Last but not least, the third group of literature believes that aging can bring negative effects to the performance of the firm due to inertia effects. Older firms become less flexible and face difficulties in dynamic or rapidly changing environment (Barron et al., 1994). Early researchers used firm age and size of the firm as a proxy to each other or we can say to measure the same phenomena, believing that younger firms tend to be smaller in size as compared to old firms.

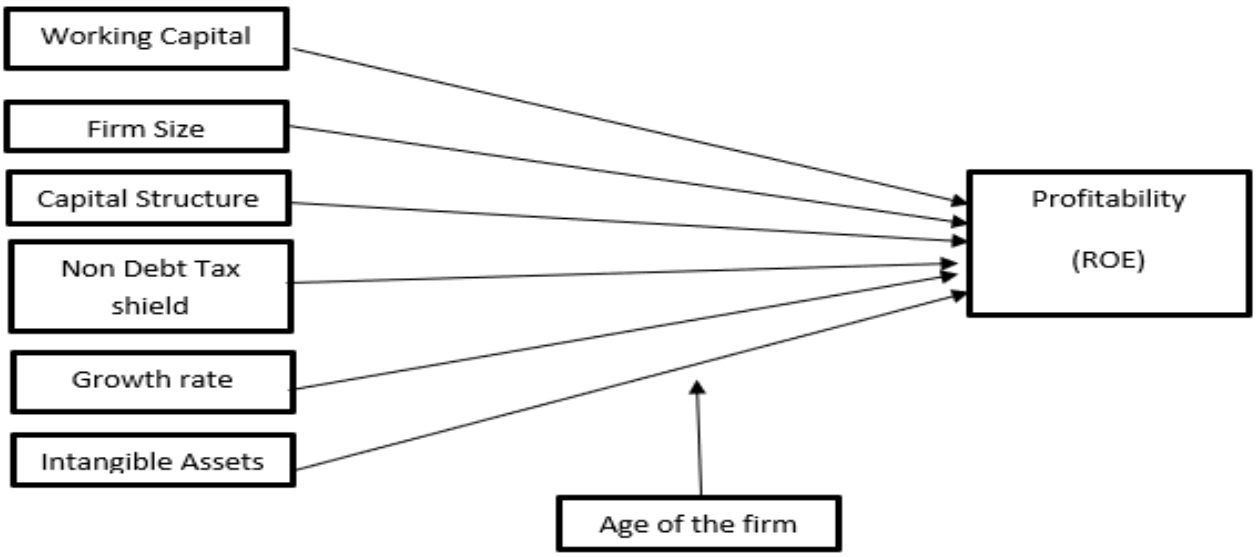
### 8.9 Hypothesis Development

On the basis of above literature following hypothesis are developed:

**H1**: There exist a significant relationship between intangible assets and profitability.

**2**: Age of the firm moderates the relationship between intangible assets and profitability.

### 2.10 Graphical Representation of Research Model




## 9. Research Methodology

The nature of the current study based on deductive approach and also quantitative in nature. The research design of the study *Causal research*, also known as explanatory. The current study is based on secondary data and the data was collected form the financial statements of the sample firms and form the historical stock prices data was collected from Business recorder and form the website of Pakistan Stock exchange. The data of 20 cement companies listed under Pakistan stock exchange has been used. The 20 years annual data has been used in this study for the period of 1998 to 2017. The data is collected from the balance sheets of the selected companies. The balance sheets of the selected companies are obtained from their official websites while the share prices are obtained from the official website of Pakistan stock exchange and Business recorder. The data is unbalanced as many firms were

started their operations after 1998, data before 1998 is not selected because of the unavailability of stock prices of before 1998. The dependent variable of this research is profitability, Denis (1994) and Lehmann & Weigand (2000) used return on assets as a proxy variable to measure profitability. So, in this research return on assets is used as a proxy variable to measure profitability. The control variables of the study include Capital structure, Growth rate, Non-debt Tax shield, and Working capital and Firm size. Intangible assets is the independent variable of the research and age of the firm is used as a moderator between intangible assets and profitability. To examine the factors that effect on profitability the following regression model is used:

**Profitability (ROE) = β0 + β1 capital structure + β2 firm size + β3 growth rate + β4 working capital + β5 non-debt tax shield + β6 intangible assets*age + εt**

To understand the importance of Panel data regression, Hausman test, and robust variance estimator and to differentiate between fixed effects model and random effects model the brief overview of the tests applied in this research.

## 10. Data Analysis and Interpretation

### 10.1 Descriptive Statistics

Descriptive statistics are used to provide the reader brief overview of the data.

**Table 4.1**

| Variable | Observations | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Capital Structure | 307 | 0.970573 | 1.144787 | 0.003518 | 12.14557 |
| Working Capital | 307 | 806849.1 | 4366362 | -5137070 | 2.88E+07 |
| Firm Size | 307 | 15.73828 | 1.240781 | 12.19143 | 18.50107 |
| Non-Debt Tax shield | 307 | 3.13E+10 | 6.37E+11 | -1.20E+12 | 1.10E+13 |
| Growth rate | 307 | 19719.74 | 170324.2 | -1 | 2395272 |
| Intangible Assets | 307 | 21.42783 | 2.060193 | 12.9192 | 26.35819 |
| Age | 307 | 30.07166 | 12.65975 | 5 | 63 |
| ROE | 307 | 0.04128 | 0.100594 | -0.43114 | 0.355313 |

### 10.2 Multicollinearity test

To check whether multicollinearity exit in the data set or not correlation matrix is used.

**Table 4.2**

| Items | CS | WC | FS | NDTS | GR | IA | Age | ROE |
|---|---|---|---|---|---|---|---|---|
| CS | 1 | | | | | | | |
| WC | 0.0642 | 1 | | | | | | |
| FS | 0.1909*** | 0.3388*** | 1 | | | | | |
| NDTS | -0.0124 | 0.0516 | 0.0362 | 1 | | | | |
| GR | 0.0347 | 0.0549 | 0.0188 | -0.0057 | 1 | | | |
| IA | 0.0928 | 0.06507*** | 0.0513*** | -0.0104 | -0.0366 | 1 | | |
| Age | 0.0367 | -0.0349 | 0.1983*** | 0.0965 | 0.1735** | -0.0422 | 1 | |
| ROE | -0.0825*** | 0.5703 *** | 0.3054*** | 0.4594*** | 0.0202 | -0.0333 | 0.661*** | 1 |

The results of the correlation matrix shows that no multicollinearity exist between independent variables. Multivariate normality test is also applied on the data and the results suggest that we reject

the null hypothesis and there are probably difference between the correlations of the variables. The results of the multivariate normality test are as under (Table 4.3),

**Table 4.3**

| | |
|---|---|
| **Lawley chi2(35)** | 617.53 |
| **Prob > chi2** | 0.0000 |

### 10.3 Serial Autocorrelation and Unit root test

To check the presence of serial autocorrelation in the data Wooldridge test is applied in the data. The results of the test are shown below in Table 4.4,

**Table 4.4**

| | |
|---|---|
| **F(1,19)** | 52.650 |
| **Prob. > F** | 0.0000 |

The results of the Wooldridge test suggest that the serial autocorrelation AR(1) is present in the data, To check whether this serial correlation exist at first order or higher order correlation is present in the data Arellano-Bond test was applied on the data, the results of the test are as under in table 4.4(a) :

**Table 4.4(a)**

| Order | Z | Prob. > z |
|---|---|---|
| 1 | -1.431 | 0.1524 |
| 2 | -2.666 | 0.0077 |

**Ho = No autocorrelation.**

The results of the Arellano-Bond test suggest that we failed to reject the null hypothesis, so no higher order serial correlation is present in the data. After multicollinearity and serial correlation we will check whether or not unit root is present in the data set Fisher-type unit root test was applied on the data. The results of the unit root test are as follows (Table 4.4(b)):

**Table 4.4(b)**

| Variable | Modified inv. chi-squared | P-Value |
|---|---|---|
| Capital Structure | 0.7273 | 0.2335 |
| Working Capital | 6.8712 | 0.0000 |
| Firm size | -0.3112 | 0.6222 |
| Non-Debt Tax shield | 23.5547 | 0.0000 |
| Growth rate | 62.6454 | 0.0000 |
| Intangible assets | -2.5413 | 0.9940 |
| Age | 156.7200 | 0.0000 |
| ROE | 2.1295 | 0.0166 |

So, results of the fisher-type unit root tests suggest the presence of unit-root in capital structure, Firm size and Intangible assets. To remove the unit root first difference is used. The results of the

fisher-type unit root test for panel data after first difference is as follows (Table 4.4(c))

**Table 4.4(c)**

| Variable | Modified inv. chi-squared | P-Value |
|---|---|---|
| D1. Capital Structure | 21.7751 | 0.000 |
| Working Capital | 6.8712 | 0.000 |
| D1. Firm size | 13.6303 | 0.000 |
| Non-Debt Tax shield | 23.5547 | 0.000 |
| Growth rate | 62.6454 | 0.000 |
| D1. Intangible assets | 19.5910 | 0.000 |
| Age | -4.2753 | 0.000 |
| ROE | 2.1295 | 0.0166 |

After applying the unit-root test, for check heteroscedasticity Breusch-Pagan test is applied on the data and the results of the test are as follows in table 4.4(d):
Ho = Constant variances

**Table 4.4(d)**

| | |
|---|---|
| **chi2(1)** | 0.00 |
| **Prob > chi2** | 0.9473 |

The results of the Breusch-Pagan test suggest that we failed to reject the null hypothesis and heteroscedasticity is not present in the data, the data is homostadistic.

### 10.4 Results of the study

Regression analysis is used to find the relation of dependent variables with independent variables. Before panel data regression, Hausman test is applied to determine the appropriate model for the data. Both random and fixed model effects models are applied, with the results of the random effects model and fixed effects models shown below.

#### 10.4.1 Panel data regression results with Random effects model AR (1):

**Table 4.5**

| Variables | Coefficient | Z | Prob. |
|---|---|---|---|
| Working capital | 5.02e-08 | 5.19 | 0.000 |
| Non Debt Tax shield | 3.69e-14 | 1.14 | 0.254 |
| Growth | 2.25e-07 | 1.53 | 0.126 |
| D1.Capital Structure | -0.0268283 | -1.43 | 0.151 |
| D1.Firm Size | 0.1407799 | 2.41 | 0.016 |
| D1.Intangible Assets | 0.0893189 | 2.84 | 0.005 |
| Constant | 0.2545298 | 2.09 | 0.036 |
| ***R-sq.: 0.3224*** | ***Wald chi2(7) = 51.07*** | | ***Prob. > chi2 = 0.000*** |
| ***No. of observations: 286*** | ***No. of groups: 20*** | | |

#### 10.4.2 Panel data regression results with fixed effects model AR (1):

**Table 4.6**

| Variables | Coefficient | T-stat | Prob. |
|---|---|---|---|
| Working capital | 3.86e-08 | 3.89 | 0.000 |
| Non-Debt Tax shield | 3.25e-14 | 1.03 | 0.306 |
| Growth | 2.05e-07 | 1.43 | 0.155 |
| D1. Capital Structure | -0.0266618 | -1.47 | 0.144 |
| D1. Firm Size | 0.1283905 | 2.26 | 0.025 |
| D1. Intangible Assets | 0.1016972 | 3.23 | 0.001 |
| Constant | 0.5538944 | 23.15 | 0.000 |
| ***R-sq.: 0.3192*** | ***F-stat = 6.64*** | | ***Prob > F = 0.000*** |
| ***No. of observations: 286*** | ***No. of groups: 20*** | | |

After the results of random effects model and fixed effects model, Hausman test is applied on the results of the data. The results of the Hausman test are shown in table 4.7:

**10.4.3 Hausman test results:**

**Table 4.7**

| | **B (Fixed)** | **B (Random)** | **b-B Difference** | **Sqrt (diag (V_b-V_B)) S.E.** |
|---|---|---|---|---|
| Working capital | 3.86e-08 | 5.02e-08 | -1.16e-08 | 2.19e-09 |
| Non-Debt Tax shield | 3.25e-14 | 3.69e-14 | -4.44e-15 | 6.77e-15 |
| Growth | 2.05e-07 | 2.25e-07 | -1.94e-08 | 2.97e-08 |
| D1. Capital Structure | -0.0266618 | -0.0268283 | 0.0001666 | 0.0043351 |
| D1. Firm Size | 0.1283905 | 0.1407799 | -0.0123894 | 0.0129246 |
| D1. Intangible Assets | 0.1016972 | 0.0893189 | 0.0123783 | 0.0009639 |
| ***Chi2 = 118.833*** | | ***Prob > chi2 = 0.000*** | | |

The results of the Hausman test failed to reject the null hypothesis as $p < 0.05$ so, fixed effects model is used to analyze the data with robust variance estimates. So as there also exist serial autocorrelation at first order, Fixed effects model with AR (1) disturbance is applied on the data. The results of the fixed effects model with AR (1) disturbance estimates is shown in table 4.8. To check the moderating effect of age of the firm the AR (1) disturbance is applied on the data with the interaction term and the results are shown in table 4.9.

**Table 4.8**

| Variables | Coefficient | T-stat | Prob. |
|---|---|---|---|
| Working capital | 3.86e-08 | 3.89 | 0.000 |
| Non Debt Tax shield | 3.25e-14 | 1.03 | 0.306 |
| Growth | 2.05e-07 | 1.43 | 0.155 |

| | | | |
|---|---|---|---|
| D1.Capital Structure | -0.0266618 | -1.47 | 0.144 |
| D1.Firm Size | 0.1283905 | 2.26 | 0.025 |
| D1.Intangible Assets | 0.1016972 | 3.23 | 0.001 |
| Constant | 0.5538944 | 23.15 | 0.000 |
| ***R-sq.: 0.3192*** | ***F-stat = 6.64*** | | ***Prob > F = 0.000*** |
| ***No. of observations: 286*** | ***No. of groups: 20*** | | |

**10.4.4 Fixed effects model with AR (1) Disturbance and interaction term:**

**Table 4.9**

| **Variables** | **Coefficient** | **T-stat** | **Prob.** |
|---|---|---|---|
| Working capital | 3.77e-08 | 4.15 | 0.000 |
| Non Debt Tax shield | 3.90e-14 | 1.25 | 0.211 |
| Growth | 2.08e-07 | 1.50 | 0.136 |
| D1.Capital Structure | -0.0286524 | -1.58 | 0.115 |
| D1.Firm Size | 0.1229079 | 2.15 | 0.032 |
| Intangible assets#Age | 0.0490053 | 8.00 | 0.000 |
| Constant | -3.199602 | -15.97 | 0.000 |
| ***R-sq.: 0.2114*** | ***F-stat = 21.93*** | | ***Prob > F = 0.000*** |
| ***No. of observations: 286*** | ***No. of groups: 20*** | | |

The results of the panel data regression show that the selected independent variables impact the profitability by 21.14%. The model is also significant as Prob. > F = 0.000. Both the hypothesis of the research are accepted as the results of the study suggest that positive and significant relationship exist between intangible assets and the profitability of the cement industry of Pakistan, as the value of coefficient of intangible asset is 0.1016 and $p < 0.05$, so we can conclude that H1 is accepted. The results of the study also accept the second hypothesis that age of the firm moderates the relationship between intangible assets and the profitability of the firm in case of cement industry of Pakistan as the beta coefficient of interaction term is 0.0490 with $p < 0.05$, so H2 is accepted.

The overall model is also significant as the value of F – stat is 6.64 with $p < 0.05$, and 21.03 with $p < 0.05$ for both the models respectively. The overall variance in dependent variable was 0.3192 without interaction term, but as we introduced the interaction term in the model the variance reduced to 0.2114, and the impact of intangible assets on the profitability also reduces, so we can conclude that age of the firm moderates the relationship between intangible assets and profitability and weaken the relationship between the two variables. The variance in profitability was 0.1016 units with respect to per unit change in intangible assets, but after the introduction of interaction term this variance reduced to 0.049 units. So we can say that after the introduction of interaction term one unit increase in intangible assets (with moderating effects of age of the firm) can increase profitability of the firm by 0.049 units on average.

Although control variables are not the main concern of our research but talking about the

control variables the results reveal that working capital and firm size has a significant and positive impact on the profitability of the firm, while non-debt tax shield, growth rate and capital structure has no impact on the profitability of the firm.

The importance of cement industry under the current scenario as the nation is moving towards development and after the introduction of CPEC the demand of cement is likely to boost more as we witnessed in the ratio analysis of the cement industry that the performance of the cement industry of Pakistan had jumped significantly in the recent three to four years or we can say that after the introduction of CPEC. The managers of the firms needs to emphasize on the importance of intangible assets and should consider the formal reporting of intangible assets in their financial statements as they impact the profitability of the firm and can hold some importance to the investors.

**11. Discussion and conclusion**

The aim of the study is to analyze the impact of intangible assets on the performance of cement industry of Pakistan and to check whether age of the firm moderates the relationship between the two variables. The primary results of the study suggest that intangible assets do affect the profitability of the firm and the affect is positive. The results of the study can also be seen in the real world scenario for a layman, that firms with more fame and goodwill attract more customers thus leading to higher level of profits (in most cases), but the case is not that simple, intangible assets is a complex term which not only includes the goodwill of the firm but a lot more items. The study found that intangible assets have many dimensions that affect the profitability of a firm, including goodwill and copyrights, and that managers of the industry should manage them efficiently and disclose them in their financial statements.

Beside the impact of intangible assets on the profitability of the industry, the results of the study also revealed that age of the firm also moderates the relationship between the two variables, and weakens the relationship between intangible assets and the profitability. So. Keeping in mind that intangible assets are not only limited to the goodwill of the firm, there are many underlying assets under the banner of intangible assets which holds higher impact on the profitability of the firm which reduces by the time. There can be multiple reasons behind this moderation effect, in past many researchers predicted negative relationship between the profitability and the age of the firm, as the age of the firm increases it becomes less flexible and reluctant to change. So this factor might affect the relationship here between the intangible assets and the profitability moderated by age of the firm.

**12. Recommendations of the Research Study**

The results of this research are limited to the cement industry of Pakistan only and cannot be generalized on other industries, the determinants and their impact on the performance of the firm may vary industry to industry or firm to firm even in the same industry. Future researches can be conducted to measure the profitability of different sectors and industries to better understand the profitability. Moreover, to test the impact of intangible assets the study incorporates control variables, future researches can be conducted by using more control variables to get better results.

**13. Limitations of the Research Study**

The availability of data is also a limitation of the research. The secondary data available in Pakistan is unreliable (in some cases) and proper information is not available which limits the researcher's scope of the study. The research predicted the impact of parameters on the basis of data for the period of 1998 to 2017, which is unbalanced because many firms came into existence between that period and in some case the data of firms was unavailable, however interpolation technique was

used to cover the gap, but there is no substitute of real values. Not only limited to values the current study focused on the performance of single industry only because of its growth prospects and the current economic importance to the economy because of CPEC.

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