Financial and non-financial Determinants of Asian automobile stock prices

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Abstract:
 The purpose of this research is to find role of financial and non financial determinants affecting Asian automotive stock prices. Different combinations of financial and non financial determinants are formulated in order to analyze explanatory power of these combinations. Explanatory power is computed through R square, which determines that how much variance in dependent variable is explained by set of combination of independent variables. Significance level along with standard errors of estimates is determined under different specification test like company fixed, time fixed and cross section fixed. Data is collected from 43 companies across Asia during 2000-2016. Only those companies are included which have started their operations before 2000 in order get equal representations. Multivariate panel least square regression is used in order to determine role of financial and non financial determinants on Asian automotive stock prices.

 Under all specifications, combination of financial and non financial determinants remained statistical significant. However, explanatory power decreases when non financial factors are excluded from combinations. This shows that non financial factors are equally important and value relevant for investor. Combination's explanatory power of Book Value and earnings per share is lower than combination's explanatory of other financial and non financial determinants which indicate that investors also analyze other value relevant financial determinants than earnings.

This research article is value relevant for investors in order to make rationalized decision making. In literature, Non-financial determinants of stock price variations are not taken into consideration and financial determinants of high technological firms were reported insignificant for explaining stock price movements. This study would contribute to literature by analyzing financial and non financial determinants of automotive stock prices of whole Asian market.

Keywords: stock prices, financial determinants, non-financial determinants, Asian automotive stock prices

1. Introduction:

Automobiles are changing lives of people and enable them to socialize in such ways that were unbelievable a century ago. Automobile industry is shaping the economy of countries and now-a-days every mean of transportation ends up with either economic transaction or adds enjoyable moments in our quality life. Automobile industry of world has witnessed 30 percent appreciation form 1995-2005. According to international organization of motor vehicle manufacturers (OICA, Paris), founded in 1919, world automobile industry created 9 million jobs and manufactured 60 million units in 2005. If automobile industry given status of country, it would be 6th largest economy in world with global turnover of $3 trillion per year (OICA, 2017). In this research article, my concern is more about Asian automotive industry.

East Asian automobile industry is mainly driven by Japanese technology and Japanese foreign direct investment. However, countries specifically China and Korea experienced state sponsored initiates so that ingenious auto industry base can be developed through state sponsorship within these countries (Wad, 2009; Biswajit, Banerjee & Chatterjee, 2007). During 1990s, china received heavy foreign direct investment as most world investors sought to reap benefits from Chinese growing economy. Most of this investment was in automotive sectors (Wad, 2009; Biswajit, Banerjee & Chatterjee, 2007). During 2001, foreign direct investment in china exceeded to $333 billion when most of world investors showed interest in firms either directly or indirectly associated with Chinese automotive manufacturing industry. With $11.75 billion foreign direct investment, Indian automotive industry turnover has exceeded over $13.43 billion in 2002-03 and after three years (in 2005) India has achieved $18 billion industrial turnover and now Indian industrial turnover is over $140 billion (Wad, 2009; Biswajit, Banerjee & Chatterjee, 2007).

Europe, Australia, Middle East and ASEAN have become major automotive markets for Thailand. Thailand has now become one of world's second largest pickup truck manufacturing country after USA. Thailand's automotive industry is now dominated by Honda, Volvo, Toyota, general motors, ford, Mercedes Benz and BMW (Wad, 2009; Biswajit, Banerjee & Chatterjee, 2007). Annual automobile production units statistics for Indonesia and Malaysia remained constant between 0.3 - 0.4 million and 0.6 – 0.65 million during last five years. Statistics by FOURINE, INC (research and analysis of Asian automotive industry website) showed that Korea, Indonesia, Thailand and Malaysia untidily produced 2 million vehicles and contributed trillions of dollars in world economy up-till now. (Fourine, 2017). Asian automotive industries have different market, trade, ownership and demand structure.

Asian automotive industries are now competing against world for gaining international trade. Asian automotive industry is affected because of country's rules and regulations, country's tax structure, competition structure, market demand and trading opportunities with other countries. Indian market is having high demand for two and three wheelers and its domestic market growth is also increasing at continuous steady rate (Abrenica,

1998) . Indian automotive industry is exporting two and three wheeler to USA and Middle East. Indian tax structure is corporate friendly for local automotive manufacture as government imposes high duty on imported cars (Wad, 2009) . Chinese residents prefer passengers cars that are mainly SUV and china's automotive industry is not only oriented towards producing mechanical and electrical automotive components but also annual automobile production rate of china is greater as compared to other Asian countries. Chinese government imposes lower corporate taxes on automotive industries and lower import duties, which open doors for many foreign automotive industries. Thailand, Indonesia and Malaysia are almost having similar trade, ownership and market structure (Wad, 2009; Biswajit, Banerjee, Chatterjee, 2007). Pakistani automotive market is also dominated by Suzuki, Toyota and Honda. Hybrid vehicles are in demand by local resident because of fluctuation in fuel prices. Apart from market, demand, trade and ownership structure, automotive industries are also affected by number of internal challenges. In order to understand these challenges and their effect on automotive stock prices, complete overview of Asian automotive industrial specification is very much important. There are certain macro and macro determinants of automotive industrial stock prices (Mazzucato & Semmler, 2002; Gregoriou, Healy, & Gupta, 2015).

Trade, market, demand and taxation structures are affecting automotive stock prices (Wad, 2009; Biswajit, Banerjee & Chatterjee, 2007). Government regulations and imposition of heavy taxation on local automotive industries are negatively associated with stock price movements (Mazzucato & Semmler , 2002; Gregoriou, Healy, & Gupta, 2015). There are many external (macro) and firm related (micro) factors affecting the stock price movement. Warner, Watts, and Wruck (1988) studied the effect of change in management and its effect on firm's stock prices, results revealed negative effect of change in management on stock prices. Several studies are conducted in order to find effect of macroeconomic variables on stock price movement, through employing vector autoregressive modeling and vector error correction modeling and reported significant positive effect of GDP and interest rates on stock prices (Öhman & Yazdanfar, 2017; Pradhan, Arvin, & Ghoshray, 2015 ;Adjasi, Biekpe, & Osei, 2011; Sahu, Bandopadhyay, & Mondal, 2014; Bahmani-Oskooee & Saha, 2015). Fan, Fang, and Lu (2014) have reported negative effect of gold and exchange rate on stock price fluctuation through employing generalized autoregressive condition hetrosekadastic modeling (GARCH). Apart from these external factors, there are also certain firm related variables affecting stock price movements. Dividend, book value, debt and equity financing, total earnings and future cash flows are all firm level variables that can effect stock prices of high technological firms (Gregoriou et al., 2015).

Khanal and Mishra (2017) reported significant positive effect of dividend announcement on stock prices during period of 2006-2012 amongst North American automotive firms. Gregoriou et al. (2015) employed panel regression analysis approach in order to view the effect of dividend announcement of telecommunications firms on stock prices and reported significant effect on stock price volatility in either time series or cross sectional specifications. Gregoriou et al. (2015) reported the result of study conducted by London economics (2015) for scrutinizing the relationship between investment and stock prices

in telecom industry. Both primary and secondary drivers of investments are having positive and significant relationship with stock prices. Louis K Chan, Yasushi Hamao, Josef Lakonishok (1991) examined stock price movement relationship with earning yield, size, book to market ratio, and cash flow yield. Results indicated that there exists strong significant relationship between these firm level variables in Japan manufacturing industry and stock price movement. Chen and Zhang (2007) have also showed relationship between financial determinants within firm on stock price volatility and elaborated that accounting variables are related to stock price volatility. Profitability, earning yield and capital investment are significantly related to stock price movements (Chen & Zhang, 2007).

Determinants of stock prices volatility is only limited to specific region, presented mixed results while replicating same sets of repeated financial variables and didn't include financial and non financial information to explain its effect on Asian automotive stock prices. To best of my knowledge, this research is first that includes earnings, book value, future cash flows, dividends, equity, capitalization and debt financing as financial determinants of Asian automotive stock price volatility and number of costumers, brand penetration rate as non financial determinants. Previous literature on relationship between accounting variables and stock price volatility is limited to manufacturing or telecommunications industry. Literature presented mixed results regarding the determinant of stock prices (see Elyasiani, E. & Mansur, 2005), As few authors have given the importance to macro level variables and few have given preference to micro-level variables. Literature is mainly limited for central Europe or North American manufacturing or technological industries. Because of economic importance of automotive industry in Asia, it is important to explore the effects of accounting variables on stock price volatility of whole Asian automotive stocks. This information about financial and non financial determinants of automotive stock prices will provide knowledge to financial analyst for sense making and improved decision making.

 Selection of financial and non financial determinants is majorly influenced by literature of stock price valuation and earnings of automotive industry in Asia. Previous researches presented mix results regarding the selection of macro and micro level financial determinants, few authors given importance to macro level determinants (Tong, Singh, & Li, 2017) and few have relied on importance of accounting variables as the determinates of stock price volatility (Gregoriou et al., 2015). Some authors appreciated the role of financial variables as deterministic of stock price volatility (Khanal & Mishra, 2017), however, according to others accounting variables of high technological firms like telecommunication sector may not be true determinants of stock price movements because are not considered as value relevant by investors (Amir & Lev, 1996). In literature, Non financial determinants of stock price variations are not taken into consideration and financial determinants of high technological firms were reported insignificant for explaining stock price movements. This study would contribute to literature by analyzing financial and non financial determinants of automotive stock prices of whole Asian market. Following the pattern of (Gregoriou et al., 2015), multivariate panel least square panel regression model is used for finding the effect of book value, profit before taxation, Dividends, leverage, free cash flows and

capitalization (capital expenditure) on Asian stock prices . Total number of cars sold and brand penetration rate is taken as non financial determinates for effecting Asian automotive stock prices volatility.

Motivation behind this research is to find the role of financial, non financial variables as deterministic factors of automotive stock industry of Asia, because automotive industry in world, if given status of country, it would be the world 6th largest economy (Fourine, 2017). Despite having such economic importance, very few articles have written on deterministic factors of automotive stock price volatility. Easton and Harris (1991) and Fama and French (1992) suggested price to book value, market capitalization and risk free rate are certain factors acting as drivers of stock prices and are important for such fundamental analysis.

This research article would explore the role of financial determinants (book value, earnings, dividends, cash flows, debt and market capitalizations) and non-financial determinants (total number of car users, brand penetration rate) on Asian automotive stock price volatility. Already published recent research article explores number of determinants effecting the stock prices and finds that greater emphasizes is given on macro economic factors for determination of stock prices.

2. Literature review: Financial and non financial determinants:

This study is influenced by literature on financial and non financial determinants of stock prices. Previous literature has given greater emphasizes on macro-level variables while little effort has been made for determining the effect of micro-financial variables on highly technological firms' stock prices. Chiang Leong and Hui (2014) examined effect of determinants on stocks prices of hotel companies listed in Singapore stock exchange. Data is collected from Singapore stock exchange website, PULSES and CIEC served as data repositories. On bases of regression analysis, a significant relationship between macroeconomic variables and stock prices is established. Bahmani-Oskooee and Saha (2015) presented a review article on future directions and recommendations for conducting research on relation between stock prices and exchange rates. Further recommendations are given for establishing symmetrical and asymmetrical relationship between exchange rates and stock prices. Adjasi et al. (2011) examined short run and long relationship between stock prices and exchange rate. Research results indicated that there exist a long term co-integration between stock prices and exchange rate in Tunisia. Impulse response function indicated that exchange rate shocks have negative significant effect on stock prices in Ghana, Kenya, Mauritius and Nigeria but positive effect on stock prices in Egypt and South Africa. Interesting aspect of research is variation in results that whenever shock is given to exchange rates, results have showed both positive and negative effects on stock prices in different countries. No efforts have been made to determine the effect of financial and non financial variables on stock price volatility, more emphasizes has been given on deterministic role of macro-level variables.

Peiró (2016) examined relationship between two macroeconomic variables i.e. production and interest rate on stock prices. This research suggested that movement in macroeconomic variables is clear deterministic of changes in stock prices in Germany, United Kingdom and France. Results indicated that industrial production is futuristic determinant of changes in stock prices, as stock prices begin to fluctuate one year in advance but interest rate fluctuation showed current, simultaneous relationship with stock prices; any change in long term interest rates is reflected in current stock prices. On basis of entire period from 1962-2012 , long term interest rates and industrial production are proved to be having deterministic capacity in inducing changes in stock prices. Bhargava (2014) reported the effect of macroeconomic and microeconomic variables on stock prices of 3000 US firms from 2000-2007. Micro economic variables are classified as balance sheet items like long term debt and total assets, whereas interest rates and unemployment are characterized as macro economic variables. Research result is divided into two phases; in first phase researchers have discussed the relationship between macroeconomic and stock prices and in second phase relation between stock prices and firm level variables are explored. Results have indicated that all firm level variables and all macroeconomic variables are significant in explaining their relationship with stock prices. Wei and Guo (2017) explained the volatility of china's stock market due to oil shocks and utilises monthly data from February of 1996 to October of 2015. Results indicated that bi-directional granger casualty existed between stock prices and housing index and long term co-integration can be seen between stock prices and housing index.

Öhman and Yazdanfar (2017) considered housing index as macro economic variables in explaining stock prices. Macro economic variables are basically depiction of whole economic system of any country. Chiang Leong and Hui (2014) studied the effect of macro-economic and non macroeconomic variables on stocks prices of hotel companies listed in Singapore stock exchange. Data is collected from Singapore stock exchange website, PULSES and CIEC data repositories. On bases of regression analysis, a significant relationship between macroeconomic variables and stock prices is established. Results indicated a positive significant relationship between money supply and stock prices. Results also indicated that changes in industrial production drawn positive significant effect on stock prices but negative relationship is indicated between stock prices and interest rate. Determinates of stock price volatility is completely dominated by "relationship between macro-economic variables and stock price volatility". Hence, we can see that previous literature is dominated by deterministic role of macro-level variables in affecting stock price volatility. There are certain financial and non financial determinants of stock price volatility.

 Vuolteenaho (2002) employed vector autoregressive technique in order to find the effect of cash flow news and expected return news on stock prices. Cash flow news and expected return news both acted as strong determinants of stock prices. Stock returns are also positively correlated with cash flow news. To the best of my knowledge, no research on deterministic role of cash flows in affecting Asian automotive stock price volatility is reported. Few studies have negated the role of dividend yield as substantial determinant of highly technological firm's stock prices but few have appreciated its

deterministic power. Upinder and Herb Johnson (1994) tested wealth distribution hypothesis and content information hypothesis in order to find the effect of dividend changes on stock prices. Results indicated that dividend yield and stock price movements are positively associated with each other. Dividend yield are also having the capability and propensity to forecast stock market returns in highly technological firms. Fama and French (1988) used the regression analysis in order to find the forecasting ability of dividend yield and found that with increase in expected returns, forecasting ability of dividend yield also increases. However, some research articles presented contrasting arguments that it is impossible to determine the difference between returns of high yield stock returns from expected returns of low yield stocks. Black and Scholes (1974) suggested that one of best way to determine the effect of dividend on stock prices is to analyze the effect of dividend policy on stock prices. Since, there is no association-ship between high yield stock prices and high expected return, so finding the effect of dividend policy on stock return is of no use. Likewise dividend yield and stock price volatility relationship is controversy; there also exist mixed results regarding the role of other financial determinants and stock prices. Determining the role of dividends and cash flows has become very important but we can't ignore the role of other financial determinants like capital expenditure, debt financing, book value, earnings and non financial determinants like number of car users.

Hypothetical development for this research study is premised on efficient market theory. Investors cannot be able to gain abnormal profits from efficient market because all public and private information is embedded and embodied in stock price (Ross, Westerfied, & Jordan, 2010). In directly opposite case, such market can't be characterized as efficient market, if on basis of run test or autocorrelation test, investors can be able to get abnormal profits from the future prices of stocks on basis of past performance. According to efficient market hypothesis theory, it has become impossible for investors to purchase inflated stocks or undervalued stock, only option left for gaining benefit is through selection of riskier assets. Accounting information also plays an important role in determining the stock price volatility. Different investors value income statement items differently and their selection of relevant stock totally dependent upon the information explicitly displayed by income statements. In this research article, non-financial variables are also used in order to find out their deterministic effect on stock price volatility along with financial variables.

Research and development also plays an important role in effecting stocks price volatility. Increase in Research and development expenditure for highly technological firms is positive sign that firm is involved in exploring new avenues of innovative product and process engineering (Dranev, Levin, & Kuchin, 2017). On basis of research and development, most of organization gained competitive edge over existing rivals and established dynamic capabilities for achieving goals. Shareholders and investors view research and development cost as positive news that firm is actively engaged in innovation based exploratory activities and having the capability to introduce new dominant design(Wang & Fan, 2014). However, Chiang and Mensah (2004) found that research and development cost is not value relevant for many investors because they didn't consider research and development cost as value relevant. Research and

development initiative is not valued the same across multiple organizations. Certain factors like dominance of a firm's product in market, total technical capabilities, technological advancement and level of diversified products considered as relevant driver of research and development cost. In literature, many ways have been incorporated to measure research and development initiatives like number of newly registered patents, technological development cost by measuring SG&A or by research and development cost to sales. R&D costs also acts as proxy for measuring the firm's capacity to gain future growth and investment opportunities. However, R&D is more about prediction regarding the firm's capacity to gain future growth rather than realized actual outcome. I follow Allan C. Eberhart, William F. Maxwell and Akhtar Siddqiue (2004), who substituted R&D cost with capital expenditure because capital expenditure is based on realization rather than expectations like R&D cost. This research use capital expenditure as proxy for investment opportunities. Like dividends and Future cash flows, literature has also presented mix results regarding role of R&D initiative on stock price index, in this research R&D is replaced with capital expenditure. Investors view research and development initiatives as positive sign when taken by highly technological firms but negative when announced by low technological firms.

Capital structuring decisions are very important for continual smooth processing of day-to-day processes and operations and company's future resilience against competitive forces are also based upon these decisions(Groth & Anderson, 1997; Groth & Anderson, 1997). One of main benefit associated with debt financing is its inherent capability to reduce taxable income. Announcements of increased dependence on debt financing is seen negatively by many investors but few investors reacted positively if firm has highly productive track record. Investors perceived that new debt will act as new foundational pavement for building new technological advancement in highly technological firms (Yu & Leistikow, 2011). However, if company in question is already relying heavily on debt structuring, more dependence on debt will restrain the company from creating cash surplus (Wad, 2009). Excessive amount of cash in hand can be used in certain contingent situations, unforeseen events, competitive wars against rivals and increasing the company's capability to payback common stock holders at time of insolvency. Highly technological Companies engaged in long term debt may not be perceived positively by some shareholders because of long-term payment schedules of heavy interest rates. Debt financing although providing good opportunities for execution of highly technological and innovative projects, but its consequences are unavailable if ideas don't work well (Seppa, 2008). This research article is motivated by literature on financial and non financial determinants in affecting stock price volatility; role of certain financial determinants in affecting the stock price volatility of whole Asian automotive market is explored. Other Financial determinants like book value per share, free cash flows from operating activities per share, earnings per share are selected for determining their effect on stock price volatility because of following gaps in previous literature.

Non financial determinants are included in this research article in order to analyze their explanatory power along with other financial factors. Total number of cars sold at end of years is used as proxy variable for number of buyers or cars users at end of year.

Another important non financial variable is penetration rate of brand in its respective Asian market. Brand penetration rate can be calculated by dividing the particular brand users by relevant market size at end of year. For example , if total number of cars sold by different brands in year are 5000 and out of which 100 sold by firm A, then brand penetration of Firm A is $\frac{100}{5000}$ = 0.02 or 2%. Brand penetration can also be used to denote commercial and operational success of any company.

Literature is highly dominated by role of macro-economic variables in determining stock price volatility. Mostly studied are limited to certain country or particular specific region like south-Asia, pacific-Asia, and central Asia. Previously, Non financial and financial determinants are not taken into account for affecting the Asian automotive stock prices. Some authors appreciated the role of few financial variables as deterministic of stock price volatility, but those studies were value relevant for specific country. however, according to others accounting variables of high technological firms like telecommunication sector may not be true determinants of stock price movements because are not considered as value relevant by investors (Amir & Lev, 1996). In previous literature, Non financial determinants for affecting the stock price variations are not taken into account and financial determinants of high technological firms were insignificant for explaining automotive stock price movements. This research study employed multivariate panel least square regression model in order to investigate the effect of financial and non financial determinants on Asian automotive stock prices. To best of my knowledge, I didn't came across any research exploring the role of Financial and non financial determinants of whole Asian automotive stock price in past.

3.   Empirical method:

In this research, multivariate panel least square regression model is used in order to determine the effect of selected financial and non financial determinants on Asian automotive stock prices. The following subsections will explain the information regarding datasets, statistical model employed and financial and non financial determinants used in model.

Fig-1 Automotive manufactures in different Asian countries

Pakistan

Hinopak	Suzuki Pakistan
Toyota Indus	Honda Atlas Motors
Alghazi Tractors	Millat tractors

China

Beiging Automotive group

BYD
SAIC motors
Guangzhou,China

First Automotive works
Changan Motors
Brilliance automotive works
Chery,China
DongFeng Motor Corporation, China

Malaysia

Volvo car manufacturing Malaysia
UMW Toyota motors Malaysia
Tan Chong Motors, Malaysia
Proton Holdings, Malaysia

Bangladesh

Runner automobile

Thailand

Thai Rung Union car manufacturing

Taiwan

Taiwan Isuzu Motors
Ford Lio Ho, Motors

South Korea

Kia Motors	Ssang Yong Motors
Hyundai Motors	Renault Samsung Motors

Japan

Toyota	Suzuki	Daihatsu	Isuzu
Nissa	Mitsubishi	Hino	Subaru
Honda	mazda		

Singapore

Toyota Singapore
Renault Singapore
Nissan Singapore
Tan Chong International, Singapore

India

Tata Motors	Mahindra & Mahindra
Maruti Suzuki India	Hero Motor corp. India
Bajaj Auto ltd	Ashoq Leyland Ltd

TVS motor company   Eicher motor company,Ltd

Force Motor Ltd

Indonesia

Toyota motors	Astra Daihatsu motors
Honda Motors	Suzuki Indomobil
Mitsubishi Motors	Nissan Motors

Mercedes Benz Indonesia

Phillipines

BYD auto

Srilanka

Ashok Leyland   Tata Motors

Turkey

Karsan
otokar

a.   Data set:

In this research article, financial and non financial factors are selected in order to find their deterministic effect on Asian automotive stock price volatility from 2000-2016. Financial determinants include book value, dividends, capital expenditure, earnings, debt, cash flows and non financial determinants include total number of automobile sold and brand penetration rate in year. Relevant information regarding the non-financial determinants is obtained from world bank data base, international organization of motor vehicle association (OICA,Paris) and FOURINE, INC (research and analysis of Asian automotive industry website). Non financial determinants include total number of cars sold and brand penetration rate in a respective year. Data sets regarding non financial determinants has been obtained from OICA,Paris, Fourine,Inc (Asian's top automotive database hub) and car registration authorities, excise and taxation website of relevant countries. Information regarding the total number of unit sold is also extracted from financial statements of relevant automotive firms, Fourine,inc and OICA,paris. Data sets of financial determinants like book value, capital expenditure, earnings, dividends, debt and cash flows are obtained from financial statements of relevant firms (published). Stock exchange indexes are used in order to represent stock prices of relevant organization. Bloomberg, yahoo stock index and country specific stock exchange website like KSE for Pakistan, Bombay stock exchange for India etc are sourced for extracting data sets on stock prices from 2000 to 2016. After detailed analysis, our final sample includes 43 organizations from whole Asian continent during 2000-2016. Names of companies from relevant country are listed in fig.1

b.   *Statistical model applied:*

Following (Gregoriou et al., 2015), this research employs multivariate panel least square regression model in order to estimate the deterministic capability of each financial determinant on stock price variation. In a single multivariate panel least square regression analysis, financial and non financial determinants are included in order to estimate their effect on Asian automotive stock price volatility. Under multiple type of specification like non-fixed, time fixed and cross-sectional fixed from 2000-2016, role of financial determinants and non financial determinants is estimated in effecting Asian automotive stock price variations. I use general to specific approach; determinants are included in model in form of step by step basis. This would increase the predictability of model and help to find that which deterministic factor is strongest in effecting the Asian automotive stock prices.

$$stock\_price_{i,t} = \alpha_i + \beta_{1,i} BV_{i,t} + \beta_{2,i} FCF_{i,t} + \beta_{3,i} earnings_{i,t} + \beta_{4,i} dividends_{i,t} + \beta_{5,i} Debt_{i,t} + \beta_{6,i} cap\_xpen_{i,t} + \beta_{7,i} penetration\_rate_{i,t} + \beta_{8,i} number\_unit\_sold_{i,t} \dots\dots\dots\dots\dots\dots\dots \quad (1)$$

In equation 1, $stock\_price_{i,t}$ consist of stocks prices of company i at time t. $BV_{i,t}$ Consist of book value per share of firm i at time t . $FCF_{i,t}$ consist of free cash flows per share of firm i at third's month's end after annual report . $earnings_{i,t}$ and $Debt_{i,t}$ consist of firm i earning divided by total shares at time t and long term debt to total

assets at time t of firm i respectively. $cap\_xpen_{i,t}$ is proxy variable for research and development expenditure divided by net sales of particular firm i at time t. $dividends_{i,t}$ is the dividend per share of firms i at time t. $number\_unit\_sold_{i,t}$ and $penetration\_rate$ are two non financial deprtimiannts of asian automotive stock prices. $Number\_unit\_sold_{i,t}$ consist of number of units sold by firm i at end of year t. $penetration\_rate$ is brand penetration rate that can be calculated by dividing the particular brand users by relevant market size at end of year. For example , if total number of cars sold by different brands in year are 5000 and out of which 100 sold by firm A, then brand penetration of Firm A is $\frac{100}{5000}$ = 0.02 or 2%.

A panel regression procedure was adopted. In panel regression, the three different types of models that may be used are pooled data, Ordinary Least Square (OLS), fixed effect, and the random effect model. With the fixed effect model, time effect, or group effect or both are represented in the model with a dummy variable. This model can be mathematically presented as where the group effect is represented by dummy variable *d*1, *d*2 … *d*n − 1 with *n* number of groups; *β* the intercept, while *xit* is a vector of prectors for company *i* at time *t* and *µit* is the error term. It is also assumed that the error term is _*i* ~ *N*(0_2). The *F*-test can be used to test the significance of the group effect in this model. Also, the time effect model can be obtained using the dummy variables
Null Hypothesis: there is a correlation between individual random effect and explanatory variable.

Alternate Hypothesis: there is no correlation between individual random effect and explanatory variable where *µ* is the unobserved heterogeneity and *x* is the explanatory variables. If the test shows a correlation between the individual random effect and the explanatory variables (if the null hypothesis is rejected), then it can be concluded that the fixed effect estimator is consistent and efficient as compared with the random effect estimated coefficient (Hausman & Taylor, 1981). If the null hypothesis is not rejected, then it implies the random effect estimator is consistent and efficient. Furthermore, the Breusch–Pagan Lagrange multiplier (LM) test could be used to assess the preferred model between random effect model and the simple OLS model.

The study used the Hausman test to determine whether to use a fixed effect or a random effect model. The Hausman test basically tests whether the unique errors (*ui*) are correlated with the regressors. Also, Breusch–Pagan Lagrange multiplier (LM) test was undertaken to decide between the fixed effect and random effect model.

4. Results and discussion:

Correlation matrix between stock prices, financial and non financial explanatory factors is presented in table 1. High correlation is reported between stock prices and brand penetration rates. This shows that automotive stock holders in Asia perceive penetration rate as most attractive factor and pays greater attention to brand penetration rate. Book value, units sold and capital expenditure are also highly correlated with stock prices. Investors of highly technological firms perceive technological innovations positively because according to literature, most of technological advancement by successful high

technological firms will bring dominant design. Highest correlation is also observed between book and capital expenditure because book value is calculated after deducting the liabilities from total assets and dividing by number of common shares. In this way, Capital expenditure has become main component of book value. Capital expenditure is used as proxy for research and development cost and its positive high correlation with stock prices determines that investors pay greater attention to high research and development cost along with other non-financial explanatory factors. Number of units sold is proxy variable for number of particular brand users, and is positively correlated with stock prices. Investors pay greater attention to operation and competitive success and increase in number of brand users determine the characteristics of commercial, competitive and operational success

Table 1: Correlation matrix between factors and Asian's automotive stock prices

	Stock_price	BV	FCF	Earnings	dividend	Debt	cap_xpen	penetration_rate	units_sold
Stock_price	1	0.74	0.41	0.59	0.69	-0.09	0.73	0.76	0.71
BV	.68	1	0.22	0.76	0.58	-0.08	0.91	0.89	0.78
FCF	.41	0.22	1	0.56	0.62	-0.24	0.48	0.72	0.82
Earnings	.59	0.76	0.56	1	0.67	-0.21	0.51	0.78	0.81
Dividend	.69	0.58	0.62	0.67	1	0.22	0.62	0.20	0.43
Debt	-0.09	-0.08	-0.24	-0.21	0.22	1	0.28	-0.46	-0.11
Cap_xpend	0.76	0.91	0.48	0.51	0.62	0.28	1	0.87	0.89
Penetration_ Rate	0.76	0.89	0.72	0.78	0.20	-0.46	0.87	1	0.85
Units sold	0.71	0.78	0.82	0.81	0.43	-0.11	0.89	0.85	1

In table 2, different financial and non financial factors are combined in order to observe explanatory power of combinations. Combinations with highest explanatory power are most favorable factors for investors and also determine the intensity of attention that investors pay to those combinations. Table 2 shows that investors pay greater attention to book value and capital expenditure when combined with brand penetration rate and number of brand users. Explanatory powers decreases when non financial factors combined with book value per share and earnings, this means that investors pay more attention to combination of book value, capital expenditure, number of units sold and brand penetration rate than combination of book value, earnings, brand penetration rate and number of brand users. This shows that earnings is not only the determinant of

Asian automotive stock prices but there are also many other determinates like book value, debt , capital expenditure and dividend rate and non financial determinants. Explanatory power of book value, free cash flow and non financial determinants increases when earnings is replaced with free cash because free cash flows is considered more favorable factor for investors in automotive industry. Explanatory powers increases dramatically when free cash flows is replaced with dividend in combination.

Table 2: Explanatory power of financial and non financial factors

Determinants	Non-Fixed (%) R-square adjusted	Company fixed (%) R-square adjusted	Time fixed (%) R-square adjusted	observations
BV+Earnings+penetration_rate 1060 + number_unit_sold	61.65	69.78	72.10	
BV+FCF+penetration_rate+ Number_unit_sold	64.76	71.45	73.10 1060	
BV+DIV+penetration_rate+ Number_unit_sold	65.81	73.56	74.87	1060
BV+Cap_xpen+ penetration_rate+number_ unit_sold	66.01	74.87	77.98	1060
BV+debt+penetration_rate+ Number_unit_sold	67.87	75.68	79.65	1060
BV+Debt+penetration_rate+ Number_unit_sold+earnings +FCF+Dividend	71.87	78.98	81.98	1060
Bv+ Cap_xpen+debt+earnings +FCF+Debt	70.34	77.23	80.87	1060

Table-2: R-square results of multivariate panel least-square regression model under multiple specification settings
Total observations= 15900

Different specification tests are included in model in order to avoid time specific and firm specific factors affecting the results. In tables 2 - 5, different specification test are introduced in order to get robust, reliable and legitimate results. Table 2 shows explanatory power of financial and non financial factors under different specification settings. Sample includes 70 companies from different countries in order to observe the effect of financial and non financial determinants on their stock prices. Each company is sharing diversified specifications in term of culture, policies and organizational rules or policies. They are also different in their capital structure, research and development

expenditure, dividend policies and technological advancements. Few companies have adopted cost leadership strategy but few have relied on product differentiation strategy. Some companies have more emphasizes on quality, performance and delivering product with economic price tag but few have relied on offering customized luxury products with high value and high price tags. Some companies are more innovative and adopt technological advancements before rivals adopt but some are relying on incremental designs and avoids radical innovations. Companies that rely on highly technological innovations have more capital expenditure and more relying on long term debt. Firm effect has been fixed in order to view the effect of this particular specification on model. Fixing firm effect increases explanatory power of model.

Table 3: Multivariate least square panel regression model with Non-fixed effects

Determinants	BV	Earning	Debt	FCF	Penetration_ Rate	number_ unit_sold	dividend	Cap_xpen
BV+Earnings+penetration_rate + number_unit_sold	1.2* (0.03)	2.87* (0.01)			1.98** (0.31)	0.91* (0.14)		
BV+FCF+penetration_rate+ Number_unit_sold	2.23* (0.002)			3.21** (0.372)	2.198* (0.12)	0.81* (0.21)		
BV+DIV+penetration_rate+ Number_unit_sold	1.98** (0.0123)				2.18* (0.176)	0.89* (0.1653)	3.87* (0.645)	
BV+Cap_xpen+ penetration_rate+number_ unit_sold	3.746* (0.021)				3.185* (0.0431)	1.92* (0.275)		5.76* (0.287)
BV+debt+penetration_rate+ Number_unit_sold	4.098* (0.09276)		1.87* (0.0502)		3.98** (0.1143)	1.54* (0.1027)		
BV+Debt+penetration_rate+ Number_unit_sold+earnings +FCF+Dividend	0.18* (0.361)	2.17* (0.03)	0.87 (0.08)	1.98* (0.287)	1.123* (0.12)	0.91* (0.386)	2.49* (0.76)	
Bv+ Cap_xpen+dividend+earning +FCF+Debt	1.24* (0.0745)	1.98* (0.078)	1.54* (0.01)	1.21* (0.23)			1.97* (0.91)	3.12* (0.13)

Notes: *sig at 0.05 and standards errors are in parenthesis ()

Time effect is another specification that is introduced in model for getting robust and legitimate results. After World War 2, automotive industry is continuously progressing and production capacity of major plants in world has been increased. But at certain particular instance of time, world economy has been affected from financial crisis like 2007-2008, which has affected highly technological manufacturing unit of automotive plants in all over the world. Time specification test is introduced in order to control the effect of financial crisis at certain particular time on model. Time effect is strong as compared to company effect, because fixing time effect increases the explanatory power more than fixing company effect.

Fixing time and company effect increases explanatory power of combinations of financial and non financial determinants in affecting Asian automotive stock prices. Under company effect specification, explanatory power is maximum when book value, debt, dividend and earnings are combined with non financial determinants and it gradually decreases when non financial determinants are excluded from combinations. This means that combination of debt, book value, dividends and earnings with non financial determinants are most affected by company effect. Time effect and company effect both increases the explanatory power of combinations that cause stock price volatility. Under all specification test, explanatory power decreases when non financial determinants are excluded from model. This means that investors didn't pay attention to only financial factors while making stock purchase/sell decision.

Table 3 – 5 consist of standard errors in parenthesis and significance values of selected combination of financial and non financial determinants of automotive stock prices. Results showed that non financial determinants remained significant under all specifications. This means that investors are highly interested to know the brand penetration rate and commercial, operational success of brand. Increase in number of users can be a proxy for operational and commercial success. In this research article, number of units sold is used as proxy for number of specific brand users. Significance of non financial determinants of Asian automotive stock prices means that non financial determinants should also be considered while making an investment decision in Asian automotive stock prices.

Table 4: Multivariate panel least square regression model with Time-fixed effect estimations

Determinants	BV	Earning	Debt	FCF	Penetration_ Rate	number_ unit_sold	dividend	Cap_xpen
BV+Earnings+penetration_rate + number_unit_sold	3.21* (0.09)	1.47* (0.09)			2.78** (0.91)	0.21* (0.44)		
BV+FCF+penetration_rate+ Number_unit_sold	4.17* (0.092)			3.91** (0.912)	1.288* (0.12)	0.66* (0.31)		
BV+DIV+penetration_rate+ Number_unit_sold	2.959** (0.0847)				2.971* (0.844)	0.942* (0.9284)	1.12* (0.252)	
BV+Cap_xpen+ 2.97* penetration_rate+number_ (0.287) unit_sold	4.866* (0.021)				6.973* (0.0431)	5.97* (0.275)		
BV+debt+penetration_rate+ Number_unit_sold	1.38* (0.09276)		2.87* (0.0502)		4.71** (0.4376)	2.98* (0.8357)		
BV+Debt+penetration_rate+ Number_unit_sold+earnings +FCF+Dividend	1.38* (0.561)	3.75* (0.03)	1.96* (0.08)	2.76* (0.587)	2.743* (0.832)	1.3* (0.696)	1.49* (0.706)	
Bv+ Cap_xpen+dividend+earning 4.93* +FCF+Debt (0.02)	5.74* (0.0823)	2.81* (0.093)	2.38* (0.01)	2.17* (0.92)			2.91* (0.02)	

Notes: *sig at 0.05 and standards errors are in parenthesis ()

Earnings and dividend payout ratio is statistically significant in all specifications test, this shows that earnings and dividends have significant positive effect on stock prices when company and time effect is fixed. Statistically significance of dividend payout ratio in all specification determines that investor pay much attention that whether firm is giving regular dividends over long period of time or giving dividends every year. Most of organization pays regular dividends in form of income to shareholders; most of shareholders perceive this regular incurring income as prominent attraction while making a purchase decision. Some organsaition instead of paying dividends retain the amount for future growth and investments. Future growth and investments will increase the share value of organsaition and results in form of greater profit for investors. Results showed that dividend remain significant throughout under all specification test which means that investors pays much attention to dividend payout ratio. Debt and capital

expenditure also remain statistical significance which means investors didn't react negatively if firm is having or relying on long term debt. Investors also pays greater attention to research and development cost because research and development initiative will bring new future growth prospects for organsaition in terms of innovation or dominant design.

Table 5: Multivariate panel least square regression model with cross-section-fixed effect estimations

Determinants	BV	Earning	Debt	FCF	Penetration_ Rate	number_ unit_sold	dividend	Cap_xpen
BV+Earnings+penetration_rate + number_unit_sold	3.715* (0.0741)	1.451* (0.0532)			2.289** (0.891)	3.201* (0.494)		
BV+FCF+penetration_rate+ Number_unit_sold	3.784* (0.072)			3.25** (0.112)	1.388* (0.82)	2.66* (0.71)		
BV+DIV+penetration_rate+ Number_unit_sold	3.58** (0.0183)				3.81* (0.476)	0.539* (0.2353)	1.87* (0.752)	
BV+Cap_xpen+ penetration_rate+number_ unit_sold	4.866* (0.021)				6.973* (0.0431)	5.97* (0.275)		2.97* (0.287)
BV+debt+penetration_rate+ Number_unit_sold	1.11* (0.03758)		2.15* (0.0573)		3.11** (0.9353)	1.08* (0.8125)		
BV+Debt+penetration_rate+ Number_unit_sold+earnings +FCF+Dividend	1.32* (0.037)	2.75* (0.01)	1.91* (0.07)	2.16* (0.187)	2.946* (0.942)	3.3* (0.836)	6.49* (0.376)	
Bv+ Cap_xpen+dividend+earning +FCF+Debt	2.47* (0.0823)	3.94* (0.093)	2.81* (0.01)	1.99* (0.92)			2.11* (0.02)	3.98* (0.02)

Notes: *sig at 0.05 and standards errors are in parenthesis ()

Combination with maximum explanatory power such as book value, debt, earning and non financial determinants have significant positive effect on stock prices under all specification tests. Combinations of only financial determinants have lower explanatory factor than combinations in which financial as well as non financial determinants have been included. Combinations of only earning per share and book with non financial determinants is having low explanatory power than combinations in which book value, dividend, debt, FCF, earnings and non financial determinants are included. This means

that investors also take interest in all determinants other than earning per share. Results showed financial and non-financial determinants are statistically significant.

Conclusion

High correlation is reported between stock prices and brand penetration rates. This shows that automotive stock holders in Asia perceive penetration rate as most attractive factor and pays greater attention to brand penetration rate. Book value, units sold and capital expenditure are also highly correlated with stock prices. Investors of highly technological firms perceive technological innovations positively because most of technological advancement by successful high technological firms will bring dominant design. Highest correlation is also observed between book and capital expenditure because book value is calculated after deducting the liabilities from total assets and dividing by number of common shares.

Combinations with highest explanatory power are most favorable factors for investors and also determine the intensity of attention that investors pay to those combinations. Investors pay greater attention to book value and capital expenditure when combined with brand penetration rate and number of brand users. Explanatory powers decreases when non financial factors combined with book value per share and earnings, this means that investors pay more attention to combination of book value, capital expenditure, number of units sold and brand penetration rate than combination of book value, earnings, brand penetration rate and number of brand users. This shows that earnings is not only the determinates of Asian automotive stock prices but there are also many other determinates like book value, debt , capital expenditure and dividend rate and non-financial determinants.

Explanatory power of book value, free cash flow and non financial determinants increases when earnings is replaced with free cash because free cash flows is considered more favorable factor for investors in automotive industry. Explanatory powers increases dramatically when free cash flows is replaced with dividend in combination.

Fixing time and company effect increases explanatory power of combinations of financial and non financial determinants in affecting Asian automotive stock prices. Under company effect specification, explanatory power is maximum when book value, debt, dividend and earnings are combined with non financial determinants and it gradually decreases when non financial determinants are excluded from combinations. This means that combination of debt, book value, dividends and earnings with non financial determinants are most affected by company effect. Time effect and company effect both increases the explanatory power of combinations that cause stock price volatility. Under all specification test, explanatory power decreases when non financial determinants are excluded from model. This means that investors didn't pay attention to only financial factors while making stock purchase/sell decision.

Results showed that non-financial determinants remained significant under all specifications. This means that investors are highly interested to know the brand penetration rate and commercial, operational success of brand. Increase in number of users can be a proxy for operational and commercial success. In this research article, number of units sold is used as proxy for number of specific brand users. Significance of non financial determinants of Asian automotive stock prices means that non financial determinants should also be considered while making an investment decision in Asian automotive stock prices.

Results showed that dividend remain significant throughout under all specification test which means that investors pays much attention to dividend payout ratio. Debt and capital expenditure also remain statistical significance which means investors didn't react negatively if firm is having or relying on long term debt. Investors also pays greater attention to research and development cost because research and development initiative will bring new future growth prospects for organsaition in terms of innovation or dominant design.

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