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CONTENTS

A BOUND TESTING ANALYSIS OF BANK CREDIT SUPPLY DETERMINANTS IN NIGERIA

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ABSTRACT

Purpose. *Attention of macroeconomists and financial experts has focused on the determinants of bank credit, with more attention on the demand side analysis. However, few existing study on the supply side determinants of bank credit are reported with inconsistent results, though they emphasized the role of economic growth. By employing Autoregressive Distribution Lag estimation technique, this study specifically focuses on the short-run dynamic and long-run effects of bank credit supply determinants in Nigeria using the data that span 1970-2015. We found that exchange rate, money supply, net foreign liabilities and real GDP all have a positive long-run impact on bank credit to private sector in Nigeria, whereas the effect of the general price level is negative. In the short run, the effect of money supply, net foreign liabilities and reserve requirement on bank credit to the private sector is positive with only inflation exerting a negative influence. In conclusion, policymakers are required to implement policies that stabilize the financial system and boost per capita income in order to promote a sustained and stable growth of bank credit to private sector in Nigeria. Bankers also should, however, monitor the rate at which they create credit which has implication for the overall money supply.The study was set out to estimate both the short and long-run relationship as well as dynamic effect of supply side factors on bank credit to private sector in Nigeria between 1970 and 2015.*

Methodology. *The study employed Linear Autoregressive Distributed Lag (ARDL) co-integration test as suggested by Pesaran, Shin and Smith, (2001).*

Findings. *It was evidenced that exchange rate, money supply, net foreign liabilities and real GDP all have a positive long-run impact on bank credit to private sector in Nigeria, whereas the effect of the general price level is negative. In the short run, the effect of money supply, net foreign liabilities and reserve requirement on bank credit to the private sector is positive with only inflation exerting a negative influence.*

Limitations. *This study is limited only by its focus on the supply size analysis. A new line of study is suggested that can possibly investigate both the demand and supply size analysis together in one paper.*

Originality. *This is an original work and has neither been published in any other peer-reviewed journal nor is under consideration for publication by any other journal.*

1. INTRODUCTION

Globally, the importance of financial system is critical to the functioning of an economy as a whole and financial institutions such as banks are central to the financial system. In the literature of finance, aside the provision of employment, finance also serves three main purposes, which are credit provision, liquidity provision and risk management services that allow businesses and households to pool their risks from exposures to financial market and commodity price risks. Much of this is provided by banks through derivatives transactions. The supply of high powered money from the central bank forms the basis of the overall money supply in an economy (Blanchard, 2005). The supply of bank credit, especially for business investment, therefore primarily depends on the amount of monetary base at any given period of time. Central banks influence bank credit, as well as overall money supply, through the use of a numbers of instruments including discount rate and reserve requirement which have implication for the cost of borrowing.

Mild monetary conditions and healthy banking sector enhance credit creation while financial market imperfections generate borrowing constraints, hence lower credit as well as economic growth (Imran and Nishat, 2013). Apart from the monetary factors, the ability of Deposit Money Banks (DMBs) to lend funds to business firms is limited by economic atmosphere. Since commercial banks are also in business to maximize the returns to their shareholders, their lending behaviour largely considers economic situations. During recession, business activities are on the downturn and banks find it more risky to lend to businesses as default rate tends to increase while rising prices signal opportunities for firms to increase the prices of their products and make higher profits in the process. However, rising prices is an indication of economic instability and may suggest increasing cost of input, which could affect business growth while banks may be reluctant to lend funds for investment in such economic situation. In addition, an economy's engagement in foreign activities is mainly financed through bank credit. Hence, banks monitor exchange rate movement and other foreign activities of an economy in order to lend funds to the most profitable activities. Thus, a strong financial system is an essential catalyst for economic growth and development while the performance of an economy is important for the functioning of the financial system. This two-way process has implication for credit growth.

Bank lending channel is important channel through which government monetary policies transmit into real economic activities. Given the nature of small scale firms, which dominate business activities in Nigeria, they are not listed on the stock exchange and cannot raise funds through shares and therefore rely on bank credit. The amount of bank credit available influences the interest rate which has implication for individual savers and investors as well as banks who have the task of deciding which of the alternatives is worthy of the available funds.

In Nigeria, Deposit Money Banks (DMBs) are major players in funds mobilizing. Intuitively, DBMs help mobilized resources from the surplus segments of the economy to the deficit sectors; thus ensuring a more dexterous resource distribution and utilization. Domestic credit provided to private sector in the country remained unstable for most of the periods 1970-2015. Prior to the introduction of universal banking system in Nigeria in year 2001; which allow DMBs to choose the segment of the financial market they wish to operate, commercial banks are at the retail end of the market where the small and medium savings are mobilized and disbursed in form of loans, purchases of non-equity securities and trade credits provisions to firms and corporations for financing their operations.

However, though the nature of the bond for bank credit determinants has been empirically debated overtime, but there is no consensus. In the literature, two major strands are prominent about the drivers of bank credit in an attempt to enhance the financing of business operations on the part of firms and corporations - the demand and the supply side approach. Studies such as Qayyum, 2002; Khawaja and Din, 2007; Awan, 2009; Afzal and Mirza, 2010; Ali, Akhtar, and Ahmed, 2011; Sharma and Gounder, 2012; Tan, 2012; Ewert, 2000; Akinleye, 2012; Asekome and Agbonkhese, 2014 and Emecheta and Ibe, 2014, among others, focus on the demand side analysis of bank credit using different countries and econometrics techniques.

The few existing empirical studies on the supply side determinants of bank credit (Guo and Stepanyan, 2011; Olokoyo, (2011); Imran and Nishat, 2013 and Assefa, 2014) reported inconsistent results, though they emphasized the role of economic growth. To the best of our knowledge, such empirical analysis is limited to Olokoyo, (2011) in Nigeria which utilized data covering the period 1980-2005. Given recent developments in the financial sector in Nigeria including the introduction of cashless policy, there is need for new empirical evidence that captures the dynamics in the economy. Therefore, this study seeks to estimate both the short and long-run relationships as well as dynamic effect of supply side factors on bank credit to private sector in Nigeria between 1970 and 2015. Interestingly, it is observed that there is no such study that captures the relevant supply side variables in the same framework for the Nigeria. Understanding the nature of the bond among these supply side factors, has a great implication for policy-makers' decision about the appropriate strategies and policies to adopt towards making financial resources such as loans, purchases of non-equity securities, trade credits and other accounts receivables available to support the private sector of the economy. Therefore, this present study identifies the supply side factors that influence bank credit allocation to business firms in Nigeria.

Pertinent to the above, this current study improves on previous studies by estimating the Autoregressive Distributed Lag (ARDL) co-integration test popularly known as the bound test and error correction model (ECM) to shows the long-run

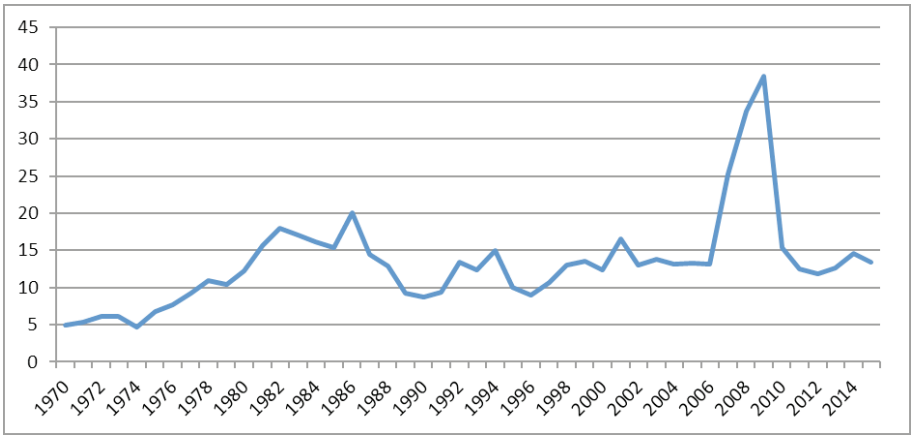
relationships and dynamic interactions of foreign liabilities, growth, interest rate spread and its determinants. Following the introductory section, the rest of the paper is organized into five sections as follows: the next section, section two provides brief stylized facts on Nigerian Bank credit. This is followed by section three, where detailed literature review was examined. Section four detailed the econometric methodology and data sources for the study. Section five entails the results and discussions of findings, section six, the last section, focuses on the conclusion and policy implications of the study.

2. STYLIZED FACTS ON NIGERIA BANK CREDIT

Globally, financial institutions help in the mobilization and distribution of funds in form of loans, purchases of non-equity securities and trade credits provisions to firms and corporations. These funds are later utilised by the corporate organisations for financing and expanding their business operations. In Nigeria, following the deregulation of interest rate in the post 1986 Structural Adjustment Programme (SAP) era, the spread between deposit and lending rate began to widen and thus, interest rate spread increased remarkably. Moreover, the increasing divergence between the lending rate and the deposit rate, otherwise known as the interest rate spread measures distortions in the money market. This interest rate spread, along with some other macroeconomic variables, is depicted in Table 1. On a five years average, between 1970 and 1974, the interest rate spread was 3.84%, rising to a value of 7.14% and 6.69% during the periods 2000-2004 and 2005-2009 respectively. Recently, the value of the interest rate spread stood at 8.77% in 2015. These high interest rate spread periods infer that cost of borrowing has gone up in the organised financial market, thereby increasing the cost of operations in Nigeria. However, domestic credit to private sector spread rose from 5.44% in 1970-1974 period to 15.79% in 1980-1984 and a peak of 24.76% in 2005-2009. The spread in domestic credit to private sector has since increased on yearly bases and stood at 13.37% in 2015, following a series of up and down turns.

On a yearly trend, domestic credit to private sector began with a value of 4.92% in 1970 and rose to about 12.23% in 1980. By 1990, the figure sharply dropped to 8.71% and continuously fluctuated since then. In year 2000, the figure stood at approximately 12.35%, and by 2010 and 2015, the figure had climbed up to 15.42% and 13.37% respectively on approximation. This implies more credit access to firms and corporations. The country credit provision to firms and corporations was measured at 11.80% in 2012. A critical look at Figure 1. shows that credit to private sector (% of GDP) was low and not stable initially, before picking up gradually in the later years. The best performance in the country was recorded in 2008 and 2009 respectively with a credit value of 33.75% and 38.39% of GDP.

Figure 1.: Trends of domestic credit to private sector in Nigeria (% of GDP)



Source: Author, underlying data obtained from the WDI, 2015 and 2016 online version.

Per capita GDP per capita which stood at about $694.49 in 1970 and $840.54 in 1980 and averaged $695.21 between 1980 and 1984, increased, on a five years average, to $878.85 during 2005-2009 fiscal periods and recorded an annual value of $1041.33 in 2015. A critical examination of Table 1. further showed that inflation and consumer prices (annual %) in the country has consistently maintained a double digit rate on a five years average, except between 2010 and 2014. Inflation trend has relatively been on the low side in the earlier period. However, it recorded its worst performance of 48.93%, on five years average, between in 1990 and 1994 falling to 14.99%in 2003 and 9.72% in 2015.

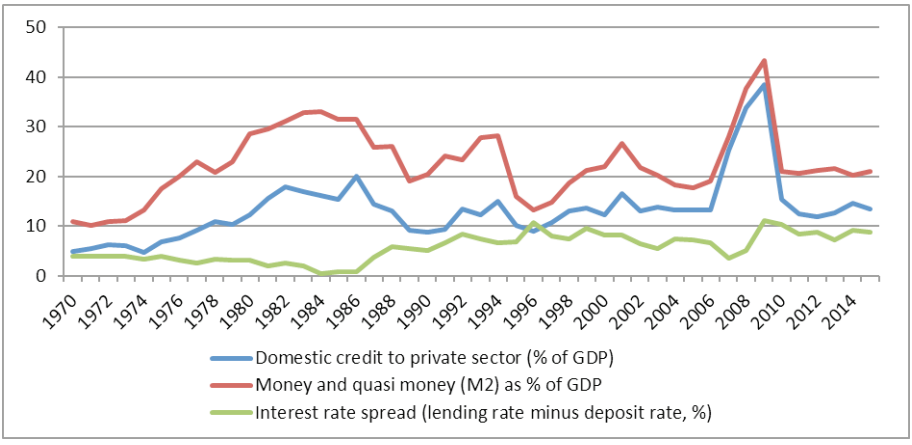
Table 1.: Trends in major macroeconomic indicators in Nigeria from 1970 to 2015

Year	Domestic credit to private sector (% of GDP)	Nigeria's external debt outstanding (N' Billion)	Inflation, consumer prices (annual %)	Official exchange rate (LCU per US$, period average)	Money and quasi money (M2) as % of GDP	Interest rate spread[1] (%)	Total reserves[2] (includes gold, current US$)	GDP per capita (constant 2005 US$)
1970 - 1974	5.44	243.68	14.30	0.67	11.26	3.84	1.48	785.73
1975 - 1979	9.01	790.64	16.56	0.63	20.84	3.22	4.64	832.66
1980 - 1984	15.79	7680.76	15.40	0.67	31.01	2.00	3.93	695.21
1985 - 1989	14.42	106778.42	25.87	3.71	26.75	3.31	1.54	551.39
1990 - 1994	11.78	490657.94	48.93	15.86	24.74	6.87	2.66	565.50
1995 - 1999	11.25	1028101.78	12.27	35.98	16.73	8.51	5.35	542.73
2000 - 2004	13.78	3915031.72	15.73	119.12	21.78	7.14	10.60	618.68

Year	Domestic credit to private sector (% of GDP)	Nigeria's external debt outstanding (N' Billion)	Inflation, consumer prices (annual %)	Official exchange rate (LCU per US$, period average)	Money and quasi money (M2) as % of GDP	Interest rate spread[1] (%)	Total reserves[2] (includes gold, current US$)	GDP per capita (constant 2005 US$)
2005 - 2009	24.76	938260.99	10.09	130.64	29.17	6.69	44.48	878.85
2010 - 2014	13.37	138953.27	9.72	155.68	20.92	8.77	40.69	1041.33
2015	13.37	2111.53	9.72	192.44	20.92	8.77	40.69	1041.33

Source: Author's computation, from Central Bank of Nigeria Statistical Bulletin and World Bank World Development Indicators (WDI), 2015 and 2016-online version.

Figure 2.: Domestic credit, financial deepening and interest rate spread in Nigeria (% of GDP)



Source: Author, underlying data obtained from the WDI, 2015 and 2016 - online version.

To ascertain the threshold relationship between credits to private sector, interest rate spread and money supply (M2) within the economy, Figure 2. provides a more direct view of the association. A perusal of the Figure does not reveal a unique relationship between credits to private sector, M2 and interest rate spread in Nigeria. Although, both credits to private sector and M2 exhibited a negative relationship with interest rate; high credits to private sector and M2 periods witnessed relatively low interest rate spread. In addition to this visual inspection, we further employed an econometric specification and estimation of the relationship.

1 Lending rate minus deposit rate.

2 In Billion.

3. LITERATURE REVIEW

A number of studies have attempted to provide empirical evidence on the determinants of bank credit. These studies differ across areas, periods, methodological approaches and findings. Most recent studies reviewed are presented in Table 2. The literature on the determinants of bank credit has been conducted either from demand side or supply side. Consequently, some studies (Takas, 2010; and Everaert, 2015) investigated the strengths of each of these approaches in explaining bank credit. Moreover, the role of interest rate and economic growth as important determinants of bank credit is stressed among literature.

On the demand side analysis, Qayyum, (2002) combined uni-variate analysis, multivariate co-integration analysis with error correction mechanism (ECM) to examine the demand for bank lending by the private business sector in Pakistan during 1960-2000. His results showed that the output of business sector, as well as the rate of interest on bank advances, is important in determining the demand for bank credit. Similarly, Sharma and Gounder, (2012) investigated the determinants of bank credit in six Pacific Island Countries between 1982 and 2009 using generalized methods of moments (GMM). They found that lending rate and inflation rate have negative effect on credit growth while demand deposit, asset size and income have positive effect on credit growth. Moreover, Tan, (2012) employed net interest margin as a specific determinants of private credit growth in a baseline regression analysis for the case of Philippines and Asia using quarterly data from 2002 to 2010. Income, reserve requirement and banking sector development have negative impact on net interest margin, whereas inflation, stock market development and government deficit exert positive effect on net interest margin. In the case of Germany, Ewert, (2000) employed panel data regression analysis to show that banks' rating is significant and positively related to the interest rate premium which is detrimental to bank lending performance.

On the supply side analysis, Imran and Nishat, (2013) adopting an autoregressive distributed lag model (ARDL) for the case of Pakistan, revealed that financial liabilities, domestic deposit, economic growth, exchange rate and M2 are significantly associated with bank credit in the long run while inflation and money market rate does not have any significant effect on bank credit. Also, their results indicated that financial health and liquidity are important determinants of loan in the short run with domestic deposit having no influence on bank credit. These findings appears to be consistent with that of Assefa, (2014) who investigated the determinants of growth in bank credit to the private sector in Ethiopia using ARDL and ECM. He found that domestic deposit, financial liabilities, real lending rate, M2, GDP and inflation rate have significant impact on bank credit in the long-run, though domestic deposit and GDP do not influence commercial bank credit. In a similar analysis of 38 emerging market economies during 2001-2010, Guo and Stepanyan, (2011) found that foreign

borrowing, domestic deposit and economic growth were the major determinants of bank credit both at pre- and post-crisis.

Pertinent to the above, both the supply and demand factors have been identified to play important roles in determining bank credit. For instance, Everaert, et al., (2015) investigated the role of supply and demand in driving the credit cycle among the Central, Eastern, and South-eastern European countries between 2003 and 2012 using maximum likelihood framework. They reported that supply factors were more important than the demand side in explaining credit growth in the post-crisis. In contrast, Shijaku and Kalluci, (2013) who adopted vector error correction model for the case of Albania, stressed that banking, financial intermediation and financial liberalisation have positive effect on lending demand while lending rate and GDP have negative effect on lending demand. The earlier findings of Takas, (2010) for the case of 21 emerging market economies from 1995 to 2009 provided reconciliation through a panel regression framework. He submitted that both demand and supply factors contributed to the fall in cross border lending to these economies during the period, but the impact of supply was stronger.

In the case of Nigeria, Olokoyo, (2011) examined the determinants of commercial banks' lending behaviour in Nigeria during 1980 - 2005. The ordinary least square (OLS) and VECM results showed that bank deposit has the greatest impact on lending behaviour. However, Akinleye, (2012) provided evidence that lending rate and saving-deposit ratio were the primary drivers of changes in the supply and demand for credit in the Nigerian banking sector. Alternatively, the results of the vector autoregressive model employed by Emecheta and Ibe, (2014) revealed a significant and positive relationship between bank credit and GDP. In an assessment of macroeconomic indicators and commercial banks' risk assets creation in Nigeria between 1981 and 2011. Asekome and Agbonkhese, (2014) indicated, in an OLS analysis, that capacity utilization and M2 have positive effect on risk asset while the impact of inflation, GDP and exchange rate is negative.

Existing studies have clearly shown inconclusive results on the determinants of bank credit as these drivers appear to vary among countries and regions. Supply-side literature has shown similar results, although with some level of agreement on the role of economic growth or income. Thus, there is need for further studies on the determinants of bank credit especially as it relates to supply factors. Furthermore, the supply side factors drive the availability of bank credit for investment purposes which in turn enhances economic growth. However, studies in this area are limited in Nigeria. To the best of our knowledge, the only related study is Olokoyo, (2011) whose results stressed the role of bank deposit, which may be a question of methodology. This present study attempts to fill these gaps and contribute to literature through an application of bound testing approach to the selected variables.

Table 2.: Summary of studies on financial development-growth nexus

S/N	Author	Scope (Period)	Methodology		Main findings
			Variables	Estimation techniques	
1	Qayyum, (2002)	Pakistan (1960-2000)	DBP, LY,R and INF	Uni-variate analysis, multivariate cointegration analysis, and ECM	The output of business sector is an important determinant of the demand for bank credit. The rate of interest on bank advances is an important determinant of the demand of credit by the business sector.
2	Imran and Nishat, (2013)	Pakistan (1971-2010)	CPI, FL, DD, Y, ER, MMR, M2 and BC	ARDL	FL, DD, Y, ER and M2 are significantly associated with BC in the long run; INF and MMR does not affect the BC; DD does not influence BC in the short-run; Financial health and liquidity are also important determinants of loan
3	Sharma and Gounder, (2012)	Six Pacific Island Countries (1982-2009)	LR, INF, BC, BD, BA, SM and Y	GMM	LR and INF have negative effect on credit growth; DD and AZ have positive effect on credit growth; Y also have positive relationship with credit growth
4	Assefa, (2014)	Ethiopia (1978-2011)	DD, FL, LR, M2, Y,	ARDL and ECM	DD, FL, LR, M2, Y, INF have significant impact on BC in the long-run; RR does not affect commercial BC both in long and short-run; In the short-run, DD and Y do not influence commercial BC
5	Asekome and Agbonkhese, 2014)	Nigeria (1981-2011)	Y, M2, ER, LR, CAU, INF and RA	OLS	Y, INF and ER have negative effect on RA while CU and M2 have positive impact on RA
6	Shijaku and Kalluci, (2013)	Albania (2001 Q1 to 2011 Q4)	BC, REER, GDB, LR, Y, NW and DD	VECM	Banking, financial intermediation and financial liberalisation have positive effect on lending demand; LR and GDB have negative effect on lending demand
7	Guo and Stepanyan (2011)	38 emerging market economies (2001-2010)	INF, Y, DR, BC(Growth rate) and M2	Regression analysis	FB, DD and Y were the major determinants of BC both at pre- and post-crisis
8	Akinleye (2012)	Nigeria ((1986-2007))	BC, LR, SDR, ER, LQR, NB and LDR	Descriptive statistics	LR and SDR were the primary drivers behind changes in the supply and demand for credit in the banking sector
9	Emecheta and Ibe, (2014)	Nigeria (1960-2011)	M2, Y and BC	VAR	Significant and positive relationship exist between BC and Y
10	Olokoyo, (2011)	Nigeria (1980 - 2005)	LA, BD, IP, LR,RR and LQR	OLS and VECM	BD has the greatest impact on lending behavior

S/N	Author	Scope (Period)	Methodology		Main findings
			Variables	Estimation techniques	
11	Takas, (2010)	21 emerging market economies (1995-2009)	V(supply side), Y(demand side) and cross border lending	Panel regression framework	Both demand and supply factors contributed to the fall in cross border lending to these economies during the period, but the impact of supply was stronger
12	Everaert et al., (2015)	Central, Eastern, and South-eastern European countries (2003-2012)	LR, INF, Y, M, UM, NW, Debt overhang, DR etc	Maximum likelihood method	Supply factors was more important than the demand side in explaining credit growth in the post-crisis period
13	Tan, (2012)	Phillipines and Asia (2002:Q1 to 2010:Q4)	Y, INF, RR, GD, DD, NIM, IP, BC (growth) etc	Baseline regression analysis	Y, RR and banking sector development have negative impact on net interest margin, whereas INF, stock market development and government deficit have positive effect on net interest margin
14	Ewert, (2000)	Germany (1992-1998)	Rating, sales, R, collateral etc	Panel data regression analysis	The banks' rating is significant and positively related to the interest rate premium, and hence important to bank lending policy

Note: ECM = Error Correction Model; BC = Bank Lending/Credit to the Private Business Sector; LY= Industrial output as proxy of output of business sector; R= Real rate of interest on bank advances; INF= Rate of inflation; CPI= Consumer price index; FL=foreign liabilities; DD= domestic deposits; Y=GDP/economic growth; ER= exchange rate; MMR= money market rate; M2= Broad money; LR= Lending rates; AZ =Asset size; BD= Bank deposit; BA=Bank asset; SM=Stock market; GMM= Generalised methods of moments; ARDL= Autoregressive distributed lag model; CU = Capacity utilisation RA=Risk asset; VECM= Vector error Correction Model, GDB = Government domestic borrowing, REER = Real effective exchange rate; NW= Net/Real wages; DR=Deposit rate; SDR=saving deposit ratio; LQR= liquidity ratio; NB = numbers of banks; LDR= loan to deposit ratio, Trade openness, GC= Government Consumption; SMT=Stock market turnover; VAR= vector autoregressive; LA=Loan advance; IP= Investment portfolio; V= Volatility of financial index; NIM= Net interest margin; M = Employment; UM= Unemployment rate; GD = government deficit; FB = Foreign borrowing.

4. METHODOLOGY

4.1. Model specification

In line with Vodova (2008), who summarizes several potential factors of demand and supply credit determinants that have been previously employed in the literature. However, Vodova (2008) himself did not utilized all of these determinants[3].

3 He noted that not all the series are suitable for the analysis of Czech credit market because; some of the variables are either not available or does not make economic sense to use. Therefore, only a part of them was used for analysis (see next chapter).

In this study[4], the explanatory variables used are, GDP, Foreign Liabilities (measured as external Debt Outstanding), inflation, exchange rate, money supply, Interest rate spread and reserve requirement. This expressed below as:

$$PSC_t = f(NFL_t, INF_t, EXCH_t, M2_t, IRS_t, RR_t, GDP_t) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where PSC = Domestic credit to private sector (% of GDP), NFL =Nigeria's External Debt Outstanding (N' Billion)[5], INF = inflation, consumer prices (annual %), EXCH = Official exchange rate (LCU per US$, period average), M2 = Money and quasi money as % of GDP, IRS = Interest rate spread (lending rate minus deposit rate, %), RR = Total reserves (includes gold, current US$) and GDP = GDP per capita (constant 2005 US$).

Theoretically, it is expected that lending capacity (IRS) of financial institutions is positively associated with credit to private sector. Furthermore, both foreign liabilities (NFL) and Money supply (M2) are expected to positively impact credit to private sector because increases in loan from foreign financial institutions and money supply to domestic banks improve their assets as well as their liquidity, as a result they can lend more at domestic level, while general price level (INF) and exchange rate (EXCH) are expected to increase bank credit. However, while GDP is expected to have positive influence on the real volume of bank credit, the effect of reserve requirement (RR) is likely to be negative. Moreover, the positive sign for GDP is due to the fact that banks may form expectation about output growth and thus, if they expect a decline in output in the future, they can lower the credit supply in the present. Also, higher reserve requirement tends to reduce the ability of commercial banks to create credit.

4.2. Estimation technique

This study adopts the Autoregressive Distributed Lag (ARDL) model to empirically analyze the above functional form. According to Pesaran et al (2001), the ARDL co-integration technique (bound test), compared to other multivariate co-integration methods[6], enables the co-integration relationship to be estimated by the ordinary least square (OLS) after determining the lag order of the model. Also, the model can accommodate regressors that are stationary at either levels I(0) or first difference I(1). In addition, the long run and short run parameters of the models can be simultaneously estimated (Pesaran et al, 2001).

The model is transformed into natural logarithmic to reduce heteroskedasticity and the ARDL estimable model is therefore, specified as:

4 While focusing only on the supply determinants factors.

5 Proxy for measure of Foreign liabilities.

6 Such as like Johansen (1998) and Johansen and Juselius (1990).

$$\Delta LNPSC_{t-i} = \alpha_0 + \alpha_1 LNPSC_{t-i} + \alpha_2 LNNFL_{t-i} + \alpha_3 LNINF_{t-i} + \alpha_4 LNEXCH_{t-i} + \alpha_5 LNM2_{t-i} + \alpha_6 LNIRS_{t-i} + \alpha_7 LNRR_{t-i} + \alpha_8 LNGDP_{t-i} + \sum_{i=1}^{p} \alpha_{9i}\,\Delta LNNFL_{t-i} + \sum_{i=1}^{p} \alpha_{10i}\,\Delta LNINF_{t-i} + \sum_{i=1}^{p} \alpha_{11i}\,\Delta LNEXCH_{t-i} + \sum_{i=1}^{p} \alpha_{12i}\,\Delta LNM2_{t-i} + \sum_{i=1}^{p} \alpha_{13i}\,\Delta LNIRS_{t-i} + + \sum_{i=1}^{p} \alpha_{14i}\,\Delta LNRR_{t-i} + \sum_{i=1}^{p} \alpha_{15i}\,\Delta LNGDP_{t-i} + \mu_t \ldots\ldots \quad (2)$$

All series are as defined before, $\mu_t \mu_t$ and LN are the white noise disturbance term and natural logarithmic respectively, while Ć is first differencing operator. The ARDL bounds test approach for the long-run relationship between credit to private sector and it's other determinants was estimated through the Wald test (F statistic), that imposed restrictions on the long-run obtained coefficients and other determinants variables to be equal to zero, that is, Ho:α1 = α2 = α3 = α4 = α5 = α6 = α7 = 0 for equation 4.

According to Pesaran et, al. (2001), the explanatory variables are assumed to be integrated of order zero, or I(0) for values of the lower bound, while the upper bound values assumed that they are integrated of order one, or I(1). The decision rule is that if the computed Ward test F-statistic exceeds the upper bound value, I(1) then it can be concluded that credit to private sector and its determinants (under equation 2) are stable and co-integrated. Contrarily, if computed Ward test F-statistics falls below the lower bound value, I(0), the null hypothesis (no co-integration) cannot be rejected while decision is inconclusive if the computed Wald test F-statistics fall between the two bounds. The bounds specification of short run dynamics is then estimated using Error Correction Model (ECM) of the following form:

$$\Delta LNPSC_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i}\,\Delta LNPSC_{t-i} + \sum_{i=1}^{p} \alpha_{2i}\,\Delta LNNFL_{t-i} + \sum_{i=1}^{p} \alpha_{3i}\,\Delta LNINF_{t-i} + \sum_{i=1}^{p} \alpha_{4i}\,\Delta LNEXCH_{t-i} + \sum_{i=1}^{p} \alpha_{5i}\,\Delta LNM2_{t-i} + \sum_{i=1}^{p} \alpha_{6i}\,\Delta LNIRS_{t-i} + + \sum_{i=1}^{p} \alpha_{7i}\,\Delta LNRR_{t-i} + \sum_{i=1}^{p} \alpha_{8i}\,\Delta LNGDP_{t-i} + \alpha_9 ECT_{t-1} + \mu_t \ldots\ldots \quad (3)$$

From equation 3, the one-time lagged residual term ($ECT_{t-1} ECT_{t-1}$) depicts the disequilibrium in the long run relationship and α's reflect the rate of changes of each variable in equation (3). Consequently, equation (3) also indicates credit to private sector influenced as explained by its past values and other shocks. Also, a number of post estimation diagnostic tests such as serial correlation test, heteroskedasticity and the Autoregressive Conditional Heteroskedasticity (ARCH) effect were

applied. Thus, this representation can be used to examine both the short and long-run relationship between bank credit and its other determinants in Nigeria.

4.3. Data sources

Using annual time series data that covers the period from 1970-2015 to re-examine the link under study, all variables were sourced and computed accordingly from the Central Bank of Nigeria statistical Bulletin, 2014 and World Bank's Development Indicators (WDI, 2015 and 2016-online version).

5. EMPIRICAL RESULTS AND DISCUSSIONS

5.1. Preliminary analysis: Descriptive, Correlation analysis and Unit root test

Table 3. reports the descriptive statistics for variables employed in the analysis. The mean, standard deviation, skewness and kurtosis coefficients are shown with the Jarque-Bera statistics used to test the null hypothesis that all our variables are normally distributed. It is found that variability is highest for Nigeria foreign liabilities, reserve requirements and Gross Domestic Product, but lower for domestic credit to private sector, interest rate spread, money supply, inflation and exchange rate. Similarly, the series exchange rate, interest rate spread, money supply, Nigeria foreign liabilities (NFL) and reserve requirements (RR) are negatively skewed and leptokurtic and the Jarque-Bera statistics reject the null hypothesis of normality very strongly. Moreover, the Jarque-Bera statistics of other series accept the null hypothesis of normality.

Table 4. also showed the pair-wise correlation analysis of the variables used in the estimation. The results of the correlation analyses showed different significance level, signs, association and strength among variables. The correlation analysis is very important to determining the type of association that exist between each of the series used; which has implication for their inclusion in the same model. Thus, our variables are conformable for inclusion in the same model. In the same vein, Table 5 validate the assumption of critical values as suggested by Pesaran et al. (2001) that the variables are integrated of order I(0) or I(1).

Table 3.: Descriptive statistics of the variables

	INF	EXCH	IRS	M2	NFL	PSC	GDP	RR
Mean	2.646	2.347	1.549	3.064	31.265	2.494	6.565	22.398
Median	2.521	2.968	1.730	3.052	32.386	2.563	6.555	22.419
Maximum	4.288	5.260	2.404	3.767	36.126	3.648	7.001	24.705
Minimum	1.241	-0.604	-1.150	2.307	25.888	1.547	6.203	19.225

	INF	EXCH	IRS	M2	NFL	PSC	GDP	RR
Std. Dev.	0.710	2.315	0.728	0.331	3.470	0.431	0.240	1.479
Skewness	0.618	-0.098	-1.671	-0.400	-0.189	0.051	0.198	-0.011
Kurtosis	2.820	1.330	6.271	2.977	1.488	3.845	1.656	2.152
Jarque-Bera	2.992	5.417	41.919	1.230	4.656	1.390	3.761	1.380
Probability	0.224	0.067	0.000	0.541	0.097	0.499	0.153	0.502
Sum	121.702	107.962	71.240	140.947	1438.174	114.742	302.000	1030.295
Observations	46	46	46	46	46	46	46	46

Source: Author's computation.

Table 4.: Correlation analysis of the variables

Variable(s)	INF	EXCH	IRS	M2	NFL	PSC	GDP	RR
CPI	1.000							
EXCH	-0.165	1.000						
IRS	-0.053	0.765*	1.000					
M2	0.214	0.021	-0.253***	1.000				
NFL	0.121	0.537*	0.474*	0.200	1.000			
PSC	-0.058	0.405*	0.024	0.756*	0.459*	1.000		
GDP	-0.232	0.204	-0.002	-0.021	-0.472*	0.034	1.000	
RR	-0.230	0.641*	0.444*	0.081	0.270***	0.292**	0.578*	1.000

Source: Author's computation.

The time series properties of the variables employed in this study are evaluated by conducting Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) unit root tests as suggested by both Dickey and Fuller (1979) and Phillips and Perron (1987). The results of the unit root tests are presented in Table 5. Test for stationarity shows that all variables are integrated of order I(1) and thus, stationary after first differencing, except for inflation (INF) and credit to private sector (PSC) that are stationary at level.

Table 5.: Unit root tests results

Variable		Unit root tests		Order of cointegration
		ADF	PP	
INF	Level	-3.7815*	-3.6244*	I(0)
	1st Difference	-6.9812*	-9.8284*	
EXCH	Level	-0.2429	-0.3432	I(I)
	1st Difference	-5.3843*	-5.3873*	
IRS	Level	-2.0311	-2.0766	I(I)
	1st Difference	-6.8378*	-7.2854*	
M2	Level	-3.5119**	-2.4980	I(I)
	1st Difference	-5.4744*	-5.3980*	
NFL	Level	-2.4215	-1.5530	I(I)

Variable		Unit root tests		Order of cointegration
		ADF	PP	
	1st Difference	-4.3560*	-4.1469*	
PSC	Level	-2.6254***	-2.6268***	I(0)
	1st Difference	-5.3826*	-6.9510*	
GDP	Level	-0.3055	-0.6286	I(I)
	1st Difference	-5.7040*	-5.7039*	
RR	Level	-1.9251	-1.9813	I(I)
	1st Difference	-5.6403*	-5.9541*	

Source: Author's computation.
Note: ADF and PP statistics with intercept,*, ** and ***indicates 1%, 5% and 10%significance level respectively, the optimal lag structure is determined by SIC.

5.2. Analysis of regression results

Proceeding to the co-integration test; the empirical result from the bounds test co-integration[7] for bank credit supply determinants in Nigeria is presented in Table 6. The result revealed the computed F-Statistics for Wald test to be 18.69. The value exceeds both the upper bounds and lower bounds critical values for all level of significance. Therefore, the statistics test yields evidence of a long-run relationship between domestic credit to private sector, Nigeria foreign liabilities, inflation, exchange rate, money supply, interest rate spread, reserve requirements and gross domestic product at all levels of significance in Nigeria.

Table 6.: Bounds testing for Co-integration analysis

Computed Wald f-statistic: 18.6988 (AIC Lags = 1)		
Bounds level:	Lower I(0):	Upper I(1):
1% critical bounds value	2.96	4.26
5% critical bounds value	2.32	3.50
10% critical bounds value	2.03	3.13

Source: Author's computation.
Notes: for the Wald F-Statistic; Asymptotic critical value bounds are obtained from Table C1 (iii) Case III: unrestricted intercept and no trend for k=7 (Pesaran, et. al 2001, pg. 300).

5.2.1. Determinants of bank credit in Nigeria

The short-run and long-run ARDL results for the determinants of bank credit are presented in Table 7. Long-run results indicated that the price level exert negative and significant effect on bank credit as the elasticity of bank credit

7 According to Pesaran et, al. (2001), the decision rule is that if the computed F-statistic exceeds the upper bound value, I(1) then it can be concluded that the independent variable and its determinants are stable and co-integrated. Contrarily, if computed F-statistic falls below the lower bound value, I(0), the null hypothesis (no co-integration) cannot be rejected.

with respect to price level is -0.12. However, the coefficients of exchange rate, money supply, net foreign liabilities and real GDP are positive and statistically significant. The results show that 1.0% increase in exchange rate or money supply led to about 0.07%or 0.71% rise respectively in bank credit. Also, a similar percentage rise in net foreign liability or real GDP increased bank credit by about 0.08% or 0.91% respectively. The results further, reveal that interest rate spread and reserve requirement does not have significant impact on bank credit in the long-run.

In the short-run, the coefficients of inflation and reserve requirement are negative and significant. Particularly, 1.0% increase in inflation or reserve requirement reduced bank credit by about 0.07% or 0.17% respectively. Conversely, the impact of money supply and net foreign liabilities on bank credit is positive and significant. Thus, the elasticity of bank credit with respect to money supply and net foreign liabilities is about 1.0 and 0.05 respectively. The effect of exchange rate, interest rate spread and real GDP on bank credit is insignificant.

Table 7.: Parsimonious Long-run and Short-run ARDL-ECM results, Dependent variable is PSC

Variable	Long-run	Short-run
LOGCPI	-0.1225(-2.2527)**	-0.0684 (-2.0851)**
LOGEXCH	0.0712 (1.9551)***	-0.0793 (-1.0778)
LOGIRS	-0.1478 (-1.5415)	0.0086 (0.1689)
LOGM2	0.7093 (3.4045)*	0.9790 (8.0261)*
LOGNFL	0.0814 (3.0690)*	0.0454 (2.9904)*
LOGRGDP	0.9063 (2.3850)**	-0.1112 (-0.3566)
LOGRR	-0.1029 (-1.6105)	-0.1660 (-4.2030)*
ECM(-1)		-0.5585 (-4.4720)*
C	-5.4216 (-2.2438)**	
R-SQUARE	0.9523	
AdJ. R-SQUARE	0.9322	
F-STATISTICS	47.6080*	
AIC	-1.3719	
SIC	-0.8099	
D-WATSON	2.1254	
Breusch-Godfrey serial correlation LM test	0.2282 (2)	
ARCH test	0.8505(2)	
Breusch-Pagan-Godfrey	0.7231 (2)	
Ramsey RESET test	2.1433	

Source: Author's estimation from E-views 9. Note: *,** and*** denote the level of significance at 1%, 5% and 10% respectively, while values in parenthesis are the t-statistics. Also, F-statistics of Breusch-Godfrey Serial Correlation LM Test, ARCH Test, White Heteroskedasticity test andRamsey RESET testwith lag 1.

The coefficient of the error correction term (ECM) indicates that 56% deviation from the long-run equilibrium level of bank credit to the private sector is corrected for annually. Moreover, the diagnostic tests confirm the correctness of the estimated model. The Breusch-Godfrey LM test statistics rejected the existence of serial correlation, while the ARCH test and Breusch-Pagan-Godfrey confirms that the residuals are homoscedastic. Also, the Ramsey RESET test suggests that the specified functional form is adequate.

The significant negative coefficient of inflation implies that increase in general price level has decreasing effect on bank credit to the private sector both in the short and long-run. In Nigeria, inflation has continued to rise over the last three to four decades. This rising price level may suggest high inflation rate in the economy especially when such changes is persistent which is an indication of economic instability and rising cost of production. This economic phenomenon is usually a disincentive for commercial banks to lend to businesses for investment purposes. Further, the estimates indicate that money supply and net foreign liabilities exert increasing effect on bank credit to private sector both in the short and long-run. Increase in money supply raise the ability of commercial banks to increase bank loans for investment. Similarly, the easier it is for Nigerian banks to get loans from foreign financial institutions, the higher their level of assets and liquidity, hence bank credit. The findings in respect of inflation and money supply are consistent with those of Imram and Nishat (2013) for the case of Pakistan while the findings with respect to foreign liabilities support those of Assefa (2014) for the case of Ethiopia.

The effect of real income (real GDP) and exchange rate on bank credit is only in the long-run while that of reserve requirement is only in the short-run. The positive coefficient of real GDP indicates that as the economy grows and real income rises, banks become optimistic about business outcomes and are more willing to grant credit to firms. Also, the positive effect of exchange rate reveals that the value of private credit in terms of domestic currency appears to rise relative to foreign currency credit. These findings are also in line with Imram and Nishat (2013). Contrary to Assefa (2014) where insignificant effect of reserve requirement on bank credit was reported, the findings of this present paper suggest that as reserve requirement increases, the ability of banks to create money through bank credit is reduced significantly in the short-run. Moreover, interest rate spread appears to have negligible impact on bank credit as its contribution may be infinitesimal both in the short and long-run.

As a check of robustness of the results, the analyses on determinants of bank credit supply are further conducted for quarterly series of the same variables covering the same period. The results of the analysis, which are reported in the appendix, are similar to those obtained for the annual series. However, the results of the quarterly analysis showed that the effect of inflation is in the long run while that of exchange rate and real GDP appears both in the short and long-run.

6. CONCLUSION AND POLICY RECOMMENDATIONS

This study queries the long-run and short-run supply side factors influencing bank credit in Nigeria using annual data for the period of 1970-2015 by applying the ARDL-ECM-Bounds test proposed by Pesaran *et al*. (2001). Results showed evidence of a long-run relationship among domestic credit to private sector, real GDP, foreign liabilities, inflation, exchange rate, money supply, interest rate spread and reserve requirement at all levels of significance for Nigeria.

Specifically, findings reveal that exchange rate, money supply, net foreign liabilities and real GDP have positive long-run impact on bank credit to private sector in Nigeria, whereas the effect of general price level is negative. In the short run, the effect of money supply, net foreign liabilities and reserve requirement on bank credit to private sector is positive with only inflation exerting negative influence. The effect of interest rate spread is insignificant. Thus, the health of the financial system including bank liquidity is important for bank credit determination. A strong economic condition increased aggregate demand and improves business atmosphere which reduces the probability of moral hazard and adverse selection and creates incentives for banks to give credit in the process. This increases the level of investment across sectors, hence increasing the per capita income and savings will in turn raises bank credit in the process. Policy makers are required to implement policies that stabilize the financial system and boost per capita income in order to promote a sustained and stable growth of bank credit to private sector in Nigeria.

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APPENDIX: QUARTERLY SERIES RESULTS

Table A: Parsimonious Long-run and Short-run ARDL-ECM results, Dependent variable is PSC

Variable	Long-run	Short-run
LOGCPI	-0.0780 (-1.1175)	-0.0561 (-3.9099)*
LOGEXCH	0.0721(1.7195)***	0.0090 (1.6640)***
LOGIRS	-0.1334 (-1.2720)	-0.0167 (-1.3994)
LOGM2	0.7823 (3.8124)*	1.0586 (20.3301)*
LOGNFL	0.0695 (2.4776)**	0.0323 (3.7350)*
LOGRGDP	0.8822 (2.2677)**	0.1103 (2.1560)**
LOGRR	-0.0980 (-1.5542)	-0.1423 (-8.5551)*
ECM(-1)		-0.1250 (-3.5576)*
C	-5.390121 (-2.1100)**	
R-SQUARE	0.9809	
AdJ. R-SQUARE	0.9796	
F-STATISTICS	729.0920*	
AIC	-2.7060	
SIC	-2.4780	
D-WATSON	1.9804	
Breusch-Godfrey serial correlation LM test	0.0113	
ARCH test	1.7583	
Breusch-Pagan-Godfrey	0.8950	
Ramsey RESET test	0.6159	

Source: Author's estimation from E-views 9. Note: *,** and*** denote the level of significance at 1%, 5% and 10% respectively, while values in parenthesis are the t-statistics. Also, F-statistics of Breusch-Godfrey Serial Correlation LM Test, ARCH Test, White Heteroskedasticity test and Ramsey RESET test with lag 1.

EXCHANGE RATE, FISCAL POLICY AND INTERNATIONAL OIL PRICES IMPACT ON OIL PRICES IN PAKISTAN: A VOLATILITY AND GRANGER CAUSALITY ANALYSIS.

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ABSTRACT

Purpose. *Crude oil is an important and most demanded commodity throughout the world. There are various oil processes like electricity production, manufacturing processes and transport sector. Oil is the basic necessity thus is important to study the volatility in oil prices because oil price volatility reduces the aggregate output for short run and as a result uncertainty increases and investment also decreases (Guo and Kliesen, 2005).This research analysis the effect of exchange rate variation and the fiscal policy changes on the oil price volatility and granger causality of macroeconomic variables.Lee (1998) defined volatility as the standard deviation in a given period. She submitted that Volatility has a negative and significant impact on economic growth immediately, while the impact of oil price changes delays until after a year. She concludes by stating that it is volatility/change in crude oil prices rather than oil price level that has a significant influence on economic growth.*

Methodology. *GARCH (1,1) test define the exchange rate has not a significant relation with the local oil price but fiscal policy effect and foreign oil price has a significant relation on the local oil price. Granger Causality test indicate that oil price volatility does not granger cause on public sector investment and gross domestic production does not granger cause on public sector investment is significant. Except these relationship, all other variables relationship exist and possible.*

Findings. *This research identify the effect of exchange rate, fiscal policy and international oil prices on oil prices of Pakistan. Different econometrics tests are utilized for analyses. Due to shortage of time, money and resources, this study only focus on Pakistan but this type of study can also implemented in Asia or more developing countries for more generalize effects and conclusion.*

Originality. *This is the first implemented research who define the magnitude, direction and effects among the variable in context of Pakistan. Before this research, there is only opinions are founds by different economists, politicians and analysists.*

1. INTRODUCTION

Crude oil is an important and most demanded commodity throughout the world. There are various processes like electricity production, manufacturing processes, transport sector and much more and in all these processes. Oil is the basic necessity thus is important to study the volatility in oil prices because oil price volatility reduces the aggregate output for short run and as a result uncertainty increases and investment also decreases (Guo and Kliesen, 2005).

It is now observed that demand of oil is also increasing like it was in developed countries. Especially Asian emerging economies has increased their demand and production of oil in recent past (Birol, 2007).It is important to note that the share of oil in the economy is very important. If the share is large then affect will be greater. It is also important to note the share of oil cots in national income. This will affect both exporting and importing countries according to the extent of their particular shares in the economy.

Other factors that play an important role are the dependence of consumers on oil and the degree to which they can find alternatives to switch to other resources due to increase price of oil in international market (IEA, 2006).

Oil is the major contributor in domestic economy and also constitutes to the gross domestic product of the state. According to the IEA, in 2000, oil constituted 40% to the globalenergy requirements. As the oil price will increase, it will also increase the production cost and transportation cost in many industries and household sector. It will also increase the inflation and wage rate will also rise high. Ultimately I will affect the economic growth (O'Neill, Penm& Terrell, 2008).

The oil exporting countries are totally different from the other countries in many aspects as far as exchange rate and economic growth is concerned. The governments of oil exporting countries are large and powerful than small private secretor. The governments are strong because they receive the oil revenue which they earn from oil importing countries and hence structure of government and its policies play important role in the economic growth of the country. So in this regard the oil price is very important for oil exporting countries because the earn revenue to its maximum and use it for the economic growth of their country (Rosser & Sheehan, 1995). The fiscal and monetary policies also depend on the oil prices and government uses these funds and revenues for its expenditure.

The changes are oil prices are highly uncertain and highly unpredictable. Sometimes the projects are stopped and companies wait for the oil price increase so they can start their projects again. Norway is an oil producing country and it first introduced such policies to make a stable economy for oil price fluctuations.

The other oil producers' such as Kuwait, Indonesia and many others followed these policies and preventive measures and somehow managed to adopt measures for oil price fluctuations (Devlin & Lewin, 2004).

The explanation for this is that until 1973, oil costs design in world was not unpredictable and around then it was hard to discover relationship between oil costs and stock costs and henceforth it is hard to comprehend the definite example keeping in mind the end goal to research the relationship between oil expenses and stock expenses and the components which influence these variables (Kilian, 2007; Driesprong et al., 2004).

Crude oil and stock market relationship was first studied by Jones and Kaul in 1996. These two proposed a model called "cash-flow dividend model" and explains the link in the middle of oil and securities exchanges. They focused on four significant economies United States, Japan, United Kingdom and Canada and they contemplated that these business sectors experience extraordinary effect of oil value stuns on the money streams. Along these lines it was inferred that present and future money streams can be impacted by value stuns.

These findings were mostly relevant to American and Canadian markets while Japanese and British market didn't show significant results of this study. After Generalized Autoregressive Conditional Hetero-skedasticity model was proposed in 1999 by Sadorsky, oil price volatility was understood. This model proposes that there is an immediate relationship between oil value instability and monetary movement and clarifies that adjustments in oil costs influence financial action.

As there is observed a decline in oil reserves, it is predicted that soon there will be oil shortage. This shortage of oil is alarming and is a factor of crude oil price changes. There is no exact prediction about how much oil reserves are left before the oil wells gets dried. After the OPEC states solidarity, the demand gets increased and price of oil also gets increased significantly in 2007-2008. These two factors were considered as the major forces of price movement in oil market.

There are some political factors that are responsible for the oil price changes worldwide. Some terrorist activities in oil producing and exporting countries are a considerable threat to the oil reserves and they are also responsible for oil price movement mainly an increase in oil prices. This results in an increase in oil prices worldwide because these countries are the largest exporters of oil worldwide.

1.1. Exchange rate

Exchange rate is a rate which is used for the conversion of one currency to another currency. Its vary from country to country and economy to economy specifically based on its economic condition.

Aliyu (2008) explains that conversion scale not just goes about as a between the residential business sector and the world business sector for products and resources, however it is likewise an intensity of a nation's trade power in global exchange. It additionally maintains the inner and outside macroeconomic equalizations over the medium-to-long haul.

Mostly it is seen that researchers focus on the impact on exchange rate volatility rather than the source of exchange rate volatility. It is along these lines contended that comprehension the system of how those stuns influence the genuine swapping scale is imperative to execute a proficient and believable financial approach.

Sachs and Warner (2005) and Auty (2001) argued that looking at the growth rate of countries on the basis of natural resources; it was found that countries that have low natural resources will grow slower than those who have plenty of resources. Rickne (2009) explains that the exchange rates of resources are highly related to highly volatile commodity prices.

1.2. Fiscal Policy

Fiscal Policy is the means by which a government regulate its spending levels and tax rates to monitor and influence a nation's economy. It is the sister strategy to monetary policy through which a central bank influences a nation's money supply.

Many nations have reconsidered their fiscal and monetary policies between the borders and all these changes are caused due to globalization, scientific and technological changes. The world also experienced political and social changes and reforms and due to this financial system and economic life has totally changed. The accelerating and successive developments that world has seen Caused a number of changes (Amira et al., 2014).

In the context of the research, the price which is over to the international oil price and the effect of exchange rate on the oil price was taken as the fiscal policy effect. It is noted that no common policy was implemented by the government related to taxes and spending (subsidies) and volatility effect was implemented.

2. LITERATURE REVIEW

2.1. Exchange rate and Oil

The investigation of the impact of oil price shocks on the macroeconomic variables has extraordinarily mulled over through experimental examination. The market analysts and scrutinized concurred on the point that oil price shock diminishes monetary action and expands expansion rate in the meantime.

Ferraro et al. (2012) researches the degree to which oil costs have a dependable and stable linkage with the Canadian or U.S dollar ostensible exchange rate. The study discovered a bit deliberate relationship between oil costs and the exchange rate for the month to month and quarterly periods. There was very little effect found on daily basis. The linkage on daily basis was rather strong.

Buetzer et al. (2012) explores the degree to which oil stuns influence the worldwide currency exchange rate. The study was centered around genuine and ostensible

trade rates and in addition on a trade business sector weight record for 44 progressed and developing nations. Utilizing VAR models, they discovered no proof that trade rates of oil exporters deliberately acknowledge against those of oil shippers consequential convulsions that raise the genuine oil cost. Then again, oil exporters experienced critical thankfulness weights taking after an oil interest stun, which they have a tendency to counter by aggregating remote trade holds.

Ansar and Asghar (2013) also explained the importance and effectiveness of oil in an economy. As Pakistan is an oil importing country so Pakistan pays foreign reserves to consumes oil. So oil price shocks will adversely affect the stock market and exchange rate of Pakistan.

Muhammad et al (2013) described the causes of inflation, gold price increase and foreign exchange rate and concluded that all these factors are affected by the oil price increase. All these factors also cause the high inflation and as a result the investment and economic activities get slowed down.

2.2. Fiscal Policy, Oil and economic growth

Katsuya Ito (2010) inspected the expansion rates in Russia from 1995to 2009 by utilizing the VAR model. The study was centered on discovering the levels of swelling. The study likewise discovers the effect of oil costs on the genuine powerful conversion scale and genuine GDP for Russia.

The result showed that the real GDP in long term will grow due to oil prices fluctuations. When there will be decrease in oil prices, it will stimulate inflation and it will also affect the economic growth. This will ultimately results in appreciation of real exchange rate.

Antonio and Ricardo (2011) additionally broke down the macroeconomic impacts of monetary strategy in Portugal from 1987 to 2007 by utilizing two models; a Bayesian Structural Auto relapse model (VAR) and a Simultaneous System approach. The Results demonstrated that broad government consumption stuns will adversely influence the genuine Gross Domestic Product (GDP) and it will brings about "swarming out" impacts.

These impacts comprise of private utilization and venture and they will emphatically influence the value level and government obligation. This model affirms that sudden positive spending stuns make significant "swarming out" impacts.

2.3. Oil price and economic growth

Oil volatility is the major and most critical constituent of world economy. In spite of the fact that there are numerous option assets to oil like wind, water, atomic and sunlight based power however the part of unrefined petroleum is still critical. Because of this focal significance, any adjustment in oil costs can affect both oil im-

porting and oil sending out nations. Oil is of extraordinary significance for oil importing and in addition oil exporting economies.

Oil value changes have an immediate impact on monetary movement too concerning mechanical creation and GDP. It was found that if changes in oil costs influence the monetary action, it will influence the income of organizations for which oil is an info expense to generation. This shows the negative relationship between oil and output production.

Ji and Fan (2012) utilized bivariate EGARCH model with time differing connection development to study oil price instability overflow on other non-vitality items and found that the effect of raw petroleum market on other merchandise markets was more prominent when raw petroleum costs were high than when they were low.

Ahmad (2013) explained the industrial sector and the high demand of industrial sector to consume oil. When the oil price will increase, the production cost will also increase and as a result the overall production growth will slowed down. It was observed that industrial production decreased to a threatening level due to oil price increase.

Jawad (2013) studied different variables that cause the oil price volatility. He also analyzed the extent to which these variables affect the oil prices and as a result their impact on economic growth and economic development.

Monjazeb et al (2013) clarified the noteworthy effect of oil costs on financial development. Diverse variable used to figure the outcome. The Data of oil trading nations used to establish the consequence of oil price shock influence on financial development. The outcomes depicted that positive oil shock has positive effect and the other way around.

2.4. Oil price volatility

The most important factor contributing to oil price increase in the world is the unanticipated and high premium of risk associated with oil and its products and it is observed that this risk is increasing with time. Oil supply is also facing instability and imbalance in oil producing countries.

Oil price and income are the two main factors that set the demand side. As price increases, demand decreases and when income will be more, demand will ultimately increase. To the extent the supple side is concerned, the instabilities and concerns are more adaptable in light of the fact that is the capacity of stores, innovation, diminishment impact, slacks and leads and structure of the business sector (Robert Meier, Janet Roundtree and Michael Schaefer).

Basher and Sadorsky (2006) argued that when there will be rise in oil prices, it will leads to inflation tax. When there will be increase in oil prices, consumers will search for oil alternatives and they will look for other energy sources for the input of their industry. As other energy sources are not considered as best alternative as oil is

and they can't substitute oil perfectly so there are many risks involved with this new substitute.

The most widely used structure for the oil market in determining the prices is the demand supply mechanism (Bacon, 1991; Dees et al., 2007). It is said that it is the most powerful mechanism that has great effect on the oil market and ultimately it determines the price of oil in oil market.

3. DATA AND METHODOLOGY

3.1. Theoretical framework

Renaissance growth theory/model was an off-shoot of the symmetric and asymmetry in effect schools. Lee (1998) who was a leading proponent of this school focused her theoretical work on attempting to distinguish between oil price changes and oil price volatility. Lee (1998) defined volatility as the standard deviation in a given period. She submitted that both have negative impacts on economic growth, but in different ways: Volatility has a negative and significant impact on economic growth immediately, while the impact of oil price changes delays until after a year. She concludes by stating that it is volatility/change in crude oil prices rather than oil price level that has a significant influence on economic growth.

The trade Economic theory proposed that oil volatility due to demand and supply shocks in the universal market have unusual effects or impacts on the non-oil trade balance and the oil trade balance of oil importers and exporters economies.

Renaissance growth theory/model was an off-shoot of the symmetric and asymmetry in effect schools. Lee (1998) who was a leading proponent of this school focused her theoretical work on attempting to distinguish between oil price changes and oil price volatility. Lee (1998) defined volatility as the standard deviation in a given period. She submitted that both have negative impacts on economic growth, but in different ways: Volatility has a negative and significant impact on economic growth immediately, while the impact of oil price changes delays until after a year. She concludes by stating that it is volatility/change in crude oil prices rather than oil price level that has a significant influence on economic growth.

My study topic is also related to oil price volatility, exchange rate, fiscal policy effect and economic growth of Pakistan and all above theories supports my research topic.

3.2. Data

Secondary data are collected from IEA, IFS and World Bank from 1973 to 2014 for estimation of coefficient. The data contain on yearly basis.

3.3. Tests for Stationarity

Unit root test is used to define the trend, intercept and stationary of the secondary data for further usage. Unit root tests are performed on the log levels and first differentiations of our variables remembering the finished objective to investigate the universal properties of the data to define the game plan.

Consequently, three tests are used: Augmented Dickey-Fuller (Dickey and Fuller, 1981), Phillips Perron (Phillips and Perron, 1988) and Kwiatkowski, Phillips, Schmidt, Shin (Kwiatkowskietal, 1992) - with a consistent and design, and without example. The both ADF and PP tests is not valid stationarity a unit root , existing valid in each variable first difference, I(1) while the KPSS test is valid on I(0).

Unit root test is used to check the stationary of the data. The eight variables of time series data is stationary on the levels, at first difference and at second difference. The econometrics test Augmented Dickey-Fuller (ADF) unit root test is used for analysis of stationary The ADF test contains three type of situation for every time series. First, random selection process includes intercept (c) and trend (t). Second, random selection process includes intercept (c) but no trend (o). Third, random selection process includes lag length.

There is a trend in Oil price, Exchange rate and Selling oil price. Meanwhile, it is also anticipate a trend in Oil price volatility, Trade balance, Private sector investment, Public sector investment and Gross domestic production (GDP) of Pakistan.

Table1.: Augmented Dickey-Fuller test results

Variables	ADF test statistics	Probability	Results
Oil price	-2.2500	0.4506	I(0)
Δ Oil price	-9.1797	0.0000	I(1)
Exchange rate	-3.3776	0.0685	I(0)
Δ Exchange rate	-8.1095	0.0000	I(1)
Selling oil price	-2.9245	0.1657	I(0)
Δ Selling oil price	-7.0326	0.0000	I(1)
Oil price volatility	-6.5313	.00000	I(0)
Trade balance	-2.4905	0.3310	I(0)
Δ Trade balance	-7.5821	0.0000	I(1)
Private sector investment	-2.3140	0.4173	I(0)
Δ Private sector investment	-7.6049	0.0000	I(1)
Public sector investment	-3.5224	0.0501	I(0)
Δ Public sector investment	-6.2086	0.0000	I(1)
GDP	1.7332	0.9995	I(0)
Δ GDP	-4.7057	0.0005	I(1)

Source: Authors.

The test result indicates that the variables Oil price, Exchange Rate, Selling Oil Price, Trade Balance, Private sector investment, Public sector investment and GDP have a unit root in their levels and are stationary in their first differences but variable Oil Price Volatility has stationary at level as Table 1. demonstrate the results.

3.4. GARCH(1,1) model

To run the Generalized Autoregressive Conditional Heteroskedasticity (GARCH1, 1) test it is compulsory to make all variable data stationary. So for that aspect, make Oil Price (purchasing price from the international market), Exchange Rate and Selling Oil Price stationary at 1st difference and represent Oil price as DOP, Exchange Rate as DER, Fiscal policy effect as DFY and Selling Oil Price as DSOP. After making these variable stationary, run the Generalized Autoregressive Conditional Heteroskedasticity (GARCH1, 1) on DER and DSOP. The following result revealed:

Estimation Equation of GARCH (1, 1) Model:

DSOP = C(1)*DER + C(2)

GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1) (1)

The estimation equation of GARCH (1, 1) model described that dependent variable has auto-regress by its constant value which also include the GARCH value aspect and after that it is also auto-regress by its independent exchange rate.

Substituted Coefficients of GARCH (1, 1) Model:

DSOP = -0.731936573393*DER + 0.397331280819*DOP + 0.0946797766996 (2)

GARCH = 0.0567521045296 + 0.0500268784889*RESID(-1)^2 + 0.455602925823*GARCH(-1) (3)

DSOP = -0.204801826082*DER + 0.0863408390713 (4)

GARCH = 0.0527557654046 - 0.0159644565338*RESID(-1)^2 + 0.543480590538*GARCH(-1) (5)

The substituted coefficients describe that the coefficient of GARCH value is 0.0863 which impact as positive on selling oil price, meanwhile the exchange rate impact negatively on selling oil price and its coefficient value is -0.2048 mean one unit increase in exchange rate decrease selling oil price by 0.2048 unit.

Table 2.: GARCH (1, 1)

	Coefficient	Std. error	z-Statistic	Prob.
GARCH (1, 1)	0.0863	0.1297	0.6659	0.5055
DER	-0.2048	2.2617	-0.0905	0.9278

Source: Authors.

According to GARCH (1, 1) table the impact of GARCH coefficient and exchange rate is not significant at even 10% of significance level. The R square value is 0.6023 which describe that the 60.23% selling oil price volatility is due to exchange rate and the remaining portion of oil price volatility is due to other factors and variables.

Consequently, afterward we run the Generalized Autoregressive Conditional Heteroskedasticity (GARCH1, 1) on DFY and DSOP. The following result discovered:

Estimation Equation of GARCH (1, 1) Model:

DSOP = C(1)*DFY + C(2)

GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1) (6)

The estimation equation of GARCH (1, 1) model described that dependent variable has auto-regress by its constant value which also include the GARCH value aspect and after that it is also auto-regress by its independent fiscal policy effect.

Substituted Coefficients of GARCH (1, 1) Model:

DSOP = 0.540787146143*DFY + 0.054984949010 47

GARCH = 0.031263812648 2 + 0.242156542289*RESID(-1)^2 + 0.075882833579 7*GARCH(-1) (7)

The substituted coefficients describe that the coefficient of GARCH value is 0.0550 which impact as positive on selling oil price, meanwhile the fiscal policy effect impact positively on selling oil price and its coefficient value is 0.5408 mean one unit increase in fiscal policy effect increase selling oil price by 0.5408 unit.

Table 3.: GARCH (1, 1)

	Coefficient	Std. error	z-Statistic	Prob.
GARCH (1, 1)	0.0550	0.0525	1.0468	0.2952
DFY	0.5408	0.0421	12.8304	0.0000

Source: Authors.

According to GARCH (1, 1) table the impact of GARCH coefficient and fiscal policy effect is significant at even 1% of significance level. The R square value is 0.7808 which describe that the 78.08% selling oil price volatility is due to fiscal policy effect and the remaining portion of oil price volatility is due to other factors and variables.

Moreover, we run the Generalized Autoregressive Conditional Heteroskedasticity (GARCH1, 1) on DOP and DSOP. The following result discovered:

Estimation Equation of GARCH (1, 1) Model:

DSOP = C(1)*DOP + C(2)

GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1) (8)

The estimation equation of GARCH (1, 1) model described that dependent variable has auto-regress by its constant value which also include the GARCH value as-

pect and after that it is also auto-regress by its independent oil price.

Substituted Coefficients of GARCH (1, 1) Model:

DSOP = 0.308670558287*DOP + 0.0588096968256

GARCH = 0.057817319754 7 + 0.0246642490015*RESID(-1)^2 + 0.47071417079*GARCH(-1) (9)

The substituted coefficients describe that the coefficient of GARCH value is 0.0588 which impact as positive on selling oil price, meanwhile the oil price (international) effect impact positively on selling oil price and its coefficient value is 0.3087 mean one unit increase in oil price (international) effect increase selling oil price by 0.3087 units.

Table 4.: GARCH (1, 1)

	Coefficient	Std. error	z-Statistic	Prob.
GARCH (1, 1)	0.0588	0.1066	0.5514	0.5814
DOP	0.3087	0.1760	1.7540	0.0794

Source: Authors.

According to GARCH (1, 1) table the impact of GARCH coefficient and oil price is significant at 10% of significance level. The R square value is 0.6384 which describe that the 63.84% selling oil price volatility is due to oil price and the remaining portion of oil price volatility is due to other factors and variables.

Moreover, we run the Generalized Autoregressive Conditional Heteroskedasticity (GARCH1, 1) on DER, DFY, DOP and DSOP. The following result observed:

Estimation Equation of GARCH (1, 1) Model:

DSOP = C(1)*DER + C(2)*DFY + C(3)*DOP + C(4)

GARCH = C(5) + C(6)*RESID(-1)^2 + C(7)*GARCH(-1) (10)

The estimation equation of GARCH (1, 1) model described that dependent variable has auto-regress by its constant value which also include the GARCH value aspect and after that it is also auto-regress by its independent exchange rate, fiscal policy and oil price (international).

Substituted Coefficients of GARCH (1, 1) Model:

DSOP = -0.0502623560429*DER + 0.703458031975*DFY + 0.34249143866*DOP + 0.00242201942895

GARCH = -0.000313170210005 + 2.2490279077*RESID(-1)^2 + 0.552631272697*GARCH(-1) **(11)**

The substituted coefficients describe that the coefficient of GARCH value is 0.0550 which impact as positive on selling oil price, meanwhile the fiscal policy effect impact positively on selling oil price and its coefficient value is 0.5408 mean one unit increase in fiscal policy effect increase selling oil price by 0.5408 unit.

Table 5.: GARCH (1, 1)

	Coefficient	Std. error	z-Statistic	Prob.
GARCH (1, 1)	0.0024	0.0105	0.2297	0.8183
DER	-0.0502	0.1220	97.2660	0.6805
DFY	0.7034	0.0072	29.6357	0.0000
DOP	0.3425	0.0115	0.2297	0.0000

Source: Authors.

According to GARCH (1, 1) table the impact of GARCH coefficient and exchange rate is not significant at even 10% of significance level but fiscal policy effect and oil price (international) is significant at 10% level of significance. The R square value is 0.8491 which describe that the 84.91% selling oil price volatility is due to exchange rate, fiscal policy and oil price and the remaining portion of oil price volatility is due to other factors and variables.

4. GRANGER CAUSALITY ANALYSIS

Usually the VAR approach is used when we have an econometric hypothesis of interest that xt Granger causes Yt but Yt does not Granger cause . The Granger approach assesses whether past information on one variable would help in predicting the outcome of some other variable, given past information on the latter (Granger, 1969). It is important to note that, despite its name, Granger causality is not sufficient to imply true causality. Sims (1972) is a very famous paper showing that money Granger causes output, but output does not Granger cause money. Later Sims concluded that this does not hold if interest rates are included in the system. This illustrates a major drawback of the Granger causality test, namely the dependence on the right choice of the conditioning set, which, that we cannot assure, has been chosen large enough in practice. The Granger causality tests are most useful when the data are reasonably described by a 2-dimensional system. The tests may, however, produce misleading results when the true relationship involves three or more variables. Another potentially serious problem is the choice of sampling period: a long sampling period may hide the causality whereas for example VAR-systems of monthly data may give rise to serious measurement errors (e.g. due to seasonal adjustment procedures). Therefore, although Granger causality is a useful tool, it must be used and interpreted with care.

Granger Causality test is used to describe the casual relationship between the variables in the different econometrics models. The idea of Granger Causality is that a variable X Granger causes variable Y if variable Y can be better predicted using the histories of both X and Y then it can be predicted using the history of Y alone.

Table 6.: Granger Causality test result

Null Hypothesis	Observations	F Statistics	Probability
GDP does not Granger Cause OPV	39	0.00821	0.9918
OPV does not Granger Cause GDP		0.28185	0.7561

Source: Authors.

The above table of Granger Causality test described that neither gross domestic production Granger cause the oil price volatility and nor the oil price volatility Granger cause the gross domestic production. Meanwhile, it is observed that both statements are not significant even 10% level of significance, so it is concluded that the statement are not true or perfect or significant.

Table 7.: Granger Causality test result

Null Hypothesis	Observations	F Statistics	Probability
PRS does not Granger Cause OPV	39	0.33896	0.7149
OPV does not Granger Cause PRS		10.9927	0.0002

Source: Authors.

The above table of Granger Causality test described that private sector investment does not Granger cause the oil price volatility and the statement is not significant even 10% level of significance . Meanwhile, the test define that oil price volatility does not Granger cause private sector investment and the statement is significant at 1% level of significance, so it is concluded that there is no causality relation between oil price volatility and private sector investment .

Table 8.: Granger Causality test result

Null Hypothesis	Observations	F Statistics	Probability
PS does not Granger Cause OPV	39	0.71208	0.4978
OPV does not Granger Cause PS		1.05586	0.3590

Source: Authors.

The above table of Granger Causality test described that neither public sector investment Granger cause the oil price volatility and nor the oil price volatility Granger cause the public sector investment. Meanwhile, it is observed that both statements are not significant even 10% level of significance, so it is concluded that the statement are not true or perfect or significant.

Table 9.: Granger Causality test result

Null Hypothesis	Observations	F Statistics	Probability
TB does not Granger Cause OPV	39	0.49987	0.6110
OPV does not Granger Cause TB		0.58196	0.5643

Source: Authors.

The above table of Granger Causality test described that neither trade balance Granger cause the oil price volatility and nor the oil price volatility Granger cause the trade balance. Meanwhile, it is observed that both statements are not significant even 10% level of significance, so it is concluded that the statement are not true or perfect or significant.

Table 10.: Granger Causality test result

Null Hypothesis	Observations	F Statistics	Probability
PRS does not Granger Cause GDP	39	1.13798	0.3324
GDP does not Granger Cause PRS		0.16613	0.8476

Source: Authors.

The above table of Granger Causality test described that neither private sector investment Granger cause the gross domestic production and nor the gross domestic production Granger cause the private sector investment. Meanwhile, it is observed that both statements are not significant even 10% level of significance, so it is concluded that the statement are not true or perfect or significant.

Table 11.: Granger Causality test result

Null Hypothesis	Observations	F Statistics	Probability
PS does not Granger Cause GDP	39	1.80271	0.1803
GDP does not Granger Cause PS		5.02844	0.0122

Source: Authors.

The above table of Granger Causality test described that public sector investment does not Granger cause the gross domestic production and the statement is not significant even 10% level of significance . Meanwhile, the test define that gross domestic production does not Granger cause public sector investment and the statement is significant at 5% level of significance, so it is concluded that there is no causality relation between gross domestic production and public sector investment .

Table 12.: Granger Causality test result

Null Hypothesis	Observations	F Statistics	Probability
TB does not Granger Cause GDP	39	0.22402	0.8005
GDP does not Granger Cause TB		0.05458	0.9470

Source: Authors.

The above table of Granger Causality test described that neither trade balance Granger cause the gross domestic production and nor the gross domestic production Granger cause the trade balance. Meanwhile, it is observed that both statements are not significant even 10% level of significance, so it is concluded that the statement are not true or perfect or significant.

Table 13.: Granger Causality test result

Null Hypothesis	Observations	F Statistics	Probability
PS does not Granger Cause PRS	39	1.96515	0.1557
PRS does not Granger Cause PS		0.38791	0.6814

Source: Authors.

The above table of Granger Causality test described that neither public sector investment Granger cause the private sector investment and nor the private sector investment Granger cause the public sector investment. Meanwhile, it is observed that both statements are not significant even 10% level of significance, so it is concluded that the statement are not true or perfect or significant.

Table 14.: Granger Causality test result

Null Hypothesis	Observations	F Statistics	Probability
TB does not Granger Cause PRS	39	0.16114	0.8518
PRS does not Granger Cause TB		0.12671	0.8814

Source: Authors.

The above table of Granger Causality test described that neither trade balance Granger cause the private sector investment and nor the private sector investment Granger cause the trade balance. Meanwhile, it is observed that both statements are not significant even 10% level of significance, so it is concluded that the statement are not true or perfect or significant.

Table 15.: Granger Causality test result

Null Hypothesis	Observations	F Statistics	Probability
TB does not Granger Cause PS	39	1.63092	0.2107
PS does not Granger Cause TB		1.27067	0.2936

Source: Authors.

The above table of Granger Causality test described that neither trade balance Granger cause the public sector investment and nor the public sector investment Granger cause the trade balance. Meanwhile, it is observed that both statements are not significant even 10% level of significance, so it is concluded that the statement are not true or perfect or significant.

5. CONCLUSION

The results and outcomes based on the time series data of oil price (international oil price), exchange rate of Pakistan, selling oil price in Pakistan (which have international oil price, exchange rate effect and fiscal effect of the local government is including), oil price volatility, trade balance, private sector investment, public sector investment and gross domestic production of Pakistan from 1973 to 2014.

It is observed that the time series data of variables (Oil price, exchange rate, selling oil price, Trade balance, Public sector investment, private sector investment and Gross Domestic production of Pakistan) have a trend and also not stationary at level. After using unit root test (ADF) it is found that all variables are stationary at first difference. Oil price volatility has a trend but the variable is stationary at level.

It is anticipated through Generalized Autoregressive Conditional Heteroskedasticity (GARCH1, 1) that exchange rate of Pakistan has an insignificant effect on the oil price in Pakistan even at the 10% level of significance. Meanwhile, fiscal effect in oil price in Pakistan and oil price (international market price) has significant impact on oil price of Pakistan at the 1% and 10% level of significance respectively which is also same as the theoretical frame work described. After the analysis it is prescribed that H_{1N} hypothesis rejected that exchange rate effecting the oil prices, H_{2N} Hypothesis accepted Fiscal policy effecting the oil prices and H_{3N} Hypothesis accepted that oil price (international) effecting the oil prices (local). Pakistan is a developing economy and the variation of fiscal policy and international oil prices may more effect on the price substitution then the exchange rate effect.

Subsequently, Granger Causality test is used to describe the casual relationship between the variables (oil price volatility, trade balance, private sector investment, public sector investment and gross domestic production). The test indicate that oil price volatility does not granger cause on public sector investment and gross domestic production does not granger cause on public sector investment is significant. Except these relationship, all other variables relationship exist and possible.

6. RECOMMENDATION

The directly impact of elevated oil prices (purchased from the foreign countries) on the economies (in the emerging economies) is anticipated through the deterioration of balance of payments, exchange rate and consequential contraction of

the economies. So that's why there is a requirement to explore the oil alternatives that steadily decrease the impact of the oil price volatility and will make potential of the economy more stronger to face volatility crisis.

Government should make a proper plan and procedure according to economic growth and requirement which would help to maintain the equilibrium and decrease the effect of oil price volatility. Meanwhile, government should decrease its fiscal effect which is the major source of its income but at the same time major effect to increase the oil prices. Government of Pakistan should develop a proper formula to decrease the effect of oil price volatility to increase its economic growth.

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VOLATILITY PATTERNS OF THE LARGEST POLISH COMPANIES: SOME EVIDENCE FROM HIGH-FREQUENCY DATA

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ABSTRACT

Purpose. *The article is focused on the empirical properties of the high-frequency data of 20 selected stocks from the Warsaw Stock Exchange (in particular the ones listed on WIG 20). The intraday data from at least more than 1 year were analysed. In particular, correlation between returns and durations were checked.*

Methodology. *Also, the heterogeneous autoregressive model for realized volatility (HAR) was analysed and an attempt to construct the UHF-GARCH model was taken. The HAR model is a linear model and the UHF-GARCH is based on a certain adjustment of physical durations. Then, the standard ARMA-GARCH approach can be considered. Moreover, the hypothesis of Diamond and Verrecchia predicting a negative correlation between price changes and the time passed between transactions was checked. The analysis was done in R statistical software.*

Findings. *The presented research can serve as an introduction to some further (and more thorough and narrow) researches. Except a direct presentation of outcomes from the study of the selected stocks from the Warsaw Stock Exchange, the paper contains quite an extensive literature review on high-frequency data.*

1. INTRODUCTION

As the capabilities of data collecting and storing are increasing very rapidly, the usage of high frequency data in finance becomes more and more popular. Such a usage is also connected with the increase of the popularity of, for example, algorithmic trading and other practical applications. In such techniques even ultra-high frequency data are analysed. Of course, in a situation, when fast computational machines are unavailable, then the enormous amount of data cannot be quickly analysed and high frequency data are not so convenient.

Nowadays, transactions on stock exchanges are executed in majority by computers. Whereas not long ago most of them were done, at least in principle, by the human being. Currently, computers are capable not only of submitting, but also of managing, the stock exchange orders. It is estimated that between 50% and 77% of the trading volume in the US equities markets is nowadays done by the algorithmic trading (Cartea and Jaimungal, 2013).

Of course, such changes resulted in a vast literature on fundamentals of high frequency data analysis (for example: Ait-Sahalia and Jacod, 2014; Dacorogna et al., 2001; Mariano and Yiu-Kuen, 2008).

However, high frequency data are not just a mere increase in a computational challenge for statisticians, econometricians and programmers. They are not merely a source of more records with no new insight into the structure of the market. Tick data unveil some specific patterns and effects, which diminish even if daily data are used. In other words, high frequency data are very useful in studying the microstructure of the market (O'Hara, 1997; Hautsch, 2012; Hasbrouck, 2007).

The microstructure foundations of the Warsaw Stock Exchange were thoroughly discussed by Orłowski (2009) and Bień (2005). Yet, their researches were done for a very specific stock or for the period just after EU accession. Therefore, it seems interesting to analyse also a bit more recent period, relatively large period and for selected stocks. Usually, most researches for Polish stock exchange, cited later in this paper, were based solely on the market index. Despite the fact that the stock market index is a fair representative of the overall market, it still gives just the overall information and in certain situations may give biased results. For example, the stock market index was found to have a stronger effect on stocks than stock have on the index (Kennet et al., 2013). It seems very natural then that researches interested in the microstructure of the market should analyse also particular selected stocks.

Secondly, the developed markets were quite extensively studied in case of high-frequency data. On the other hand, less attention was given to the developing stock exchanges. However, the Warsaw Stock Exchange is the biggest in the region. As a result, it is tried herein to fill a certain literature gap and provide more detailed study on its market microstructure.

In particular, the aim of this research is to analyse certain relationships from the Warsaw Stock Exchange in the context of the market microstructure and high-frequency approach. Moreover, the aim is to formulate the results basing on the data from single stocks, instead of studying just the behaviour of the stock market index. In a more narrow sense the aim is to check the correlation between stock returns and durations between the transactions. Secondly, the volatility patterns are studied with the heterogeneous autoregressive model for realized volatility (HAR) and the UHF-GARCH model. Additionally, the standard ARMA-GARCH approach is also considered. Thirdly, the hypothesis of Diamond and Verrecchia (supposing a negative correlation between price changes and the time passed between transactions) is checked.

2. LITERATURE REVIEW

High-frequency data contain a lot of information useful for market players. For example, Andersen and Teräsvirta (2009) stressed that this information can be used for better volatility forecasting. In other words, the more frequent data can result in more accurate forecasts. Secondly, high-frequency data contain information which can be important in the context of the distribution of returns under the conditions of non-arbitrage. Moreover, this kind of data can be interestingly joint with the concept of multivariate measures of the quadratic variation. Finally, they noticed the advantages of high-frequency data in estimating realized volatility, as well as, generally in the specification and estimation of the econometric model.

As it was just aforementioned, high frequency data unveil a lot of interesting patterns and effects not seen under the analysis of less frequent records. On the contrary to daily data, tick data are characterized by unequal durations between the time of sequent transactions (i.e., a non-synchronous trading occurs). Including this information in the statistical analysis of returns shows that there is a negative serial autocorrelation between the returns. Moreover, tick data allow to include the information about the bid-ask spread, which imposes a negative first lag autocorrelation of price changes. This effect is usually named a bid-ask bounce (Bauwens, 2001; Campbell et al., 1996; Tsay, 2005). As a result, for intraday transaction data a price reversal can be observed.

Indeed, based on numerous empirical findings it is commonly agreed that the transaction data are characterised by unequally spaced time intervals between the transactions and also by the existence of a daily periodic or diurnal pattern (Ghysels, 2000). In particular, most of the transactions are executed at the beginning and at the end of the session. The number of transactions is usually the lowest in the middle of the session. Such a pattern is clearly seen as an U-shaped curve of the transactions intensity (Wood et al., 1985; Admati and Pfleiderer, 1988).

Also, the fact that multiple transactions can be executed within a single second and prices have only discrete values plays a significant role in the statistical analy-

sis (Cartea and Meyer-Brandis, 2010; Dufour and Engle, 2000; Easley and O'Hara, 1992; Engle and Russell, 1998; Manganelli, 2005).

For example, Gramming and Wellner (2002) noticed an interesting fact that the duration between transactions (or quote updates) can significantly affect the volatility. On the other hand, they questioned if the volatility does feedback the durations. Finally, they found that volatility shocks can lead to longer transaction durations.

The above observation is linked with the stimulative hypothesis of Diamond and Verrecchia (1987) who predicted a negative correlation between price changes and the time passed between transactions. Their conclusions were drawn from modelling and analysing the role of information on the market. According to their considerations, durations should be negatively correlated with price changes, because of short-selling constraints which prevent from the trading on private bad news, whereas there are no similar constraints to prevent from trading on private good news.

Their paper has been very stimulating for the further discussion and the development of numerous researches on the role of information for traders. Indeed, the presented relations are usually discussed in the context of information-based models or inventory-based models (Bowe et al., 2007; Tsay and Ting, 2008). However, it is worth to mention that basing also on the analysis of the role of information, Easley and O'Hara (1992) derived the conclusions opposite to Diamond and Verrecchia (1987).

But Tay et al. (2011) found that after long transaction durations it is more likely that prices will decline, which is consistent rather with the hypothesis of Diamond and Verrecchia (1987) than with that of Easley and O'Hara (1992). Yet, it should be mentioned, that the research of Tay et al. (2011) was based on the extension of ACD (autoregressive conditional duration) model initially proposed by Engle and Russel (1998). This model is currently one of the fundamental tool in high frequency data analysis. However, Dufour and Engle (2000) argued that long durations should have lower impact on prices than short durations.

Yet, staying with the hypothesis of the negative correlation, one can also find some reminiscences of the Elliot waves theory. According to this hypothesis, it is believed that the increases of the price are usually lasting for a longer time and are more stable than the price declines, which happen in relatively shorter periods (Frost and Prechter, 1998; Poser and Plummer, 2003). The Elliot wave theory is deeply rooted in behavioural aspects, which are also very important on stock exchanges. Nevertheless, this paper is focused only on quantitative analysis, so it will not be more discussed.

As far as now, there is no consensus amongst researchers whether a sudden price decrease should be the sing for an investor to sell the stocks as soon as possible and prevent from further price decline or should an investor wait till the price correction (i.e., to benefit from the price reversal effect). For example, a sudden price

decline can result in the decrease in the liquidity and, as a result, in further obstacles against selling stocks.

In this context, some researchers acknowledge the disposition effect. It is a name for the situation, in which investors keep their stocks even though the price has significantly fallen. Investors can be more willing to trade after price increases. Then, it can be assumed that a decrease in the liquidity is connected with a price decrease (Griffin et al., 2007). Similarly, a threat to the liquidity can result in a price decrease. But the impact between the price and the liquidity can be asymmetric. The trading volume is usually considered as the liquidity measure, as it is the simplest and the most fundamental one (Gabrielsen et al., 2011).

On the contrary to the above described effects, Ammann and Kessler (2009) analysed certain types of stock price crashes on the US market. They based on the intraday data. They found that during the crash, the liquidity is in general relatively higher, similarly as the trading volume and the number of transactions in a fixed time interval.

Jones (2002) analysed the Dow Jones index for the whole 20th century and showed that high liquidity can result in low returns. Another problem, indicated by numerous researchers is that low liquid stocks can generate relatively a bit higher returns in order to compensate relatively higher transaction costs. Yet, this liquidity premium was found rather small (Baker and Filbeck, 2015; Lhabitant and Gregoriou, 2008).

For the Warsaw Stock Exchange it was found by Doman and Doman (2010) that the liquidity is the most important factor influencing the process of discovering information by uninformed traders.

Baker and Stein (2004) introduced a certain model of various investor types. They found that lower bid-ask spread (being an indicator of the increasing liquidity) can result in lower returns. Similarly, Engle (2000) basing on ACD and GARCH type models, found that variances are high in the periods of longer durations between transactions. The usual explanation for such a relationship is derived on the basis of the asymmetry of information available for traders.

The liquidity is not observable. Therefore, there exist various liquidity measures. Unfortunately, Baker (1996) found that different measures can lead to mutually exclusive conclusions, which vary depending on which liquidity measure is used.

Yet, there has not been much research in the above direction on the Warsaw Stock Exchange. Although, Gluzicka (2013) and Doman (2008) analysed stock market indexes on the Warsaw Stock Exchange in this context. They found that there is a significant and strong correlation between the price and the trading volume during the boom. However, this correlation was significant, strong and positive only during the boom periods. On the other hand, on the bear market and shortly afterwards the sign of the correlation depended on which market index was analysed. The linear test of the Granger causality proved that the price change results in the change in the

trading volume. But it could not have been concluded that a change in the trading volume results in a change in the price. Moreover, the causality between the trading volume and returns was found significant only for few market indexes.

It is also worth to mention that for a developed market, Foster and Viswanathan (1990; 1993) observed that the trading volume should exhibit some degree of autocorrelation.

Another interesting problem is the forecasting of the volatility. Similarly, like the liquidity, it is not observable. One of the modern ways of modelling the volatility is based on the GARCH model framework. This model was introduced by Bollerslev (1986) as a generalization of the model of Engle (1982). The Engle model allows the error term to have a characteristic size of variance. The GARCH model additionally allows to include the lagged conditional variance terms as autoregressive. Then, the variance depends both on past shocks (through the lagged residuals) and the past values of itself.

The simplest type of the above family of models is the GARCH(1,1) model. In particular, x_t follows the GARCH(1,1) process, if:

$$xt = c + f1\, y1 + f2\, y2 + \ldots + fk\, yk + ut\,, \tag{1}$$

$$ut = zt\, \sqrt{ht}\,, \tag{2}$$

$$ht = w + a\,(ut{-}1)2 + b\, ht{-}1\,, \tag{3}$$

where $c, f_1, \ldots, f_k$ are parameters, $y_1, \ldots, y_k$ are explanatory variables and u is the error term. It is assumed that z_t follows the standard normal distribution with zero mean and variance one. It should be noted that there are various modifications of the simple GARCH(1,1) model. Therefore, one should rather speak of the GARCH type family of models.

For example, Xekalaki and Degiannakis (2010), Craioveanu (2008) and Doman and Doman (2009) provided thorough reviews of the applicability of various GARCH type models in finance. One of the great advantages of the GARCH model is that such a model can be quite easily fitted depending on the market specification and the research context. On the other hand, this fact can also be a drawback, as one can describe the concrete case in various ways (Ai et al., 2011; Berra and Higgins, 1993; Engle, 2001). An extensive list of various GARCH type models was presented by Bollerslev (2008) in a quite concise manner. Empirical results of the application of GARCH type models for the Warsaw Stock Exchange were described, for example, by Fiszeder (2009), Bień (2005), Doman and Doman (2005) and Ferenstein and Gšsowski (2004). It should also be mentioned that some researchers criticized the GARCH models (Starica, 2006).

Bauwens (2001) discussed the usage of GARCH(1,1) type models for intraday data and found that the influence of trade related variables is important for 5min, 10min, 15min and 30min data. However, Dacorogna et al. (2001) presented an interesting review and arguments that the estimates of the GARCH model based on a physical time can lead to spurious estimates if high frequency data are used. Shortly,

this is due to the need of incorporating the statistically significant, previously mentioned, seasonal intraday pattern (Andersen and Bollerslev, 1997); but then the aggregation properties of the model break down.

Christoffersen (2012) and Francq and Zakoian (2010) provided an interesting discussion, comparison of the GARCH based volatility with the realized volatility concept and references to the vast literature. Indeed, there are various approaches towards the estimation of the volatility of an asset (Andersen et al., 2010; 2012; Barndor-Nielsen et al., 2004). For example, if $r_{t,i}$ is the i-th intraday return on day t and n is the number of intraday returns per day, then the Eq. (4) defines the realized volatility.

$$RV_t = \Sigma_{i=1}^{n} r_{t,i}^2 \quad (4)$$

The realized volatility and the GARCH framework (together with the stochastic volatility and the implied volatility) are one of the most important approaches towards the dynamic modelling of the volatility. It is worth to mention that the realized volatility is non-parametric, whereas the volatility derived from the GARCH framework is parametric. Moreover, the GARCH model provides a one step ahead forecast given the past, whereas the realized volatility does not use the information from the other days. The important advantage of the realized volatility is that in the case of high frequency data returns the classical time series methods can be applied (Andersen et al., 2003). The concept of volatility in various aspects was thoroughly and interestingly discussed in the collection edited by Knight and Satchell (2007). Short reviews in the context of the Warsaw Stock Exchange were presented by Ślepaczuk and Zakrzewski (2009a; 2009b).

Some solutions of the previously mentioned problems with non-synchronous trading and volatility modelling, yet staying with the GARCH framework approach, were proposed, inter alia, by Rossi and Fantazzini (2014) and Chen et al. (2009; 2011). For example, Dionee et al. (2009) proposed a successful modification for the case of the Toronto Stock Exchange, Antola and Vuorenmaa (2013) for Nasdaq and Martens (2002) for S&P 500 index. Andersen and Bollerslev (1998a) decomposed the conditional variance of intraday returns into multiplicative product of diurnal components. Chanda et al. (2005) and Engle and Sokalska (2012) focused on modelling and forecasting intraday returns. The volatility was decomposed into different components, i.e., the conditional variance was expressed as a product of daily, diurnal and stochastic intraday volatility. Such a methodology was applied to 10 min returns of over 2700 US equities. Muller et al. (1997) proposed an approach connected with the hypothesis of a heterogeneous market. They used the heterogeneous interval ARCH model, in which the conditional variance depends on past squared returns taken at different frequencies. Such an approach was a try to fix the problem of the asymmetry in the standard GARCH approach.

In case of tick data Engle (2000) proposed to consider time-adjusted returns. In other words, r_t is defined to be the return in time t divided by the square root of

the duration interval time. Next, it is assumed that r_t follows the ARMA process, i.e.,

$$r_t = c + f\, r_{t-1} + g\, u_{t-1} + u_t\,, \tag{5}$$

where c, f and g are parameters and u is the error term. It is assumed that

$$u_t = z_t \sqrt{h_t}\,, \tag{6}$$

where z_t follows the standard normal distribution with zero mean and variance one and

$$h_t = w + a\,(u_{t-1})^2 + b\, h_{t-1}\,. \tag{7}$$

As a result, the ARMA(1,1)-GARCH(1,1) model can be estimated. It is an example of the simplest UHF-GARCH model (ultra-high frequency GARCH). Its advantage is that it can be easily estimated as the standard ARMA-GARCH type model. The obtained outcomes allow the estimation of the variance per unit time.

A quite different approach was proposed by Ghysels and Jasiak (1998). They modelled unequal durations by the variation of the Engle and Russell (1998) ACD model and the volatility by the GARCH(1,1) model. The discussion of this approach in the context of the UHF-GARCH type model was presented by Meddahi et al. (2006). An extensive review of ACD models, both from theoretical and applied point of view, was presented by Pacurara (2008).

However, Coen and Racicot (2004) and Racicot et al. (2008) argued that the integrated volatility method of Andersen and Bollerslev (1998a) and Bollerslev and Wright (2001) measured by the squared value of intraday returns outperforms UHF-GARCH type models.

On the other hand, an interesting and successful application of UHF-GARCH model to the Portuguese money market was done by Sol Murta (2007). Zongxin and Xiao (2011) applied similar model to 14 stocks from the Shanghai Stock Exchange. Also, Wang et al. (2010) discussed the GARCH model for the Shanghai Stock Exchange. Alfonso-Cifuentes and Serna-Cortes (2012) successfully studied the Colombian Exchange Market index with such an approach. Another interesting model was given by Darolles et al. (2000). The Bayesian inference for certain UHF-GARCH models based on the tick data for the Warsaw Stock Exchange was studied by Huptas (2009; 2013).

Later, Engle and Sun (2005) expanded the UHF-GARCH model by incorporating autocorrelations caused by the microstructure effect. Their approach was applied to the problem of a one-day volatility forecasting of the tick data.

In case of the realized volatility Andersen et al. (2007) and Corsi (2009) proposed the HAR model (heterogeneous autoregressive model for realized volatility). This model is easy to estimate and can reproduce the long memory and fat tails. The model is given by the Eq. (8).

$$RV_{t+1} = c_o + c_1\, RV_t + c_2\, RV_{t-5,t} + c_3\, RV_{t-22,t} + u_{t+1}\,, \tag{8}$$

where RV is defined as in Eq. (4).

3. METHODOLOGY

The periodicity in diurnal patterns for high frequency data can be analysed by various methods (Martens et al., 2002; Franse, 1992; Ghysels and Osborn, 2001). For example, with a help of the Fourier flexible form approximation, by sampling moments for each intraday bin or by the dynamic cubic spline (Creal et al., 2011 and 2013; Harvey, 2013; Harvey and Koopman, 1993; Ito, 2013). The last method allows for the dynamic in the periodicity, an inclusion of the day of the week effect with no seasonal dummy variables, and the fact that the overnight news can change the next day trading pattern.

But, for example, the problem of the occurrence of the day of the week effect on the Warsaw Stock Exchange is not clearly solved yet (Gajdosowva et al., 2011; Heryan and Stavarek, 2012; Jamróz and Koronkiewicz, 2014). Therefore, and also due to the simplicity, it was not taken under considerations in the present research.

It can also be assumed that the pattern of the periodicity is fixed in time. Such an assumption was made in this research, following numerous previous studies, for example, Andersen and Bollerslev (1998b), Brownlees et al. (2011), Campbell and Diebold (2005), Engle and Rangel (2008), Engle and Russell (1998) and Engle and Sokalska (2012). Therefore, the deseasonalized durations are understood as the physical time durations divided by the seasonal factor. Similarly as in the paper of Allen et al. (2006), the seasonal factor was estimated by the cubic smoothing splines with 4 effective degrees of freedom for the spline (Nychka et al., 2015) applied to the mean daily aggregated data.

Following Engle and Sokalska (2012) and Sokalska (2010) the overnight returns were excluded from the analysis. In particular, logarithmic returns were used. If the sample was aggregated into fixed time intervals, the median price was taken as a representative for a particular bin, except for the daily data, for which the last transaction price was taken. Usually, the last observation is taken in many studies also for short intervals. However, the median seems to be more representative from the point of view of an investor who can deal with this price. Nevertheless, as a bin is taken more and more smaller, the difference between different aggregation methods should diminish (Brownlees and Gallo, 2006). However, it should be mentioned that Henker and Wang (2006) argued that even small changes in the specification of time interval can significantly affect the outcomes through the severe biases in the estimated parameters. But their research was based on a very developed market, i.e., the New York Stock Exchange, and contradicted some previous findings.

Interestingly, Diebold (1988) suggested that the conditional heteroskedasticity should be smaller, when the width of an aggregate bin becomes smaller. Additionally, De Luca (2006) stated that very high frequency processes are close to the integrated GARCH(1,1) model, i.e., the IGARCH(1,1) model.

Many empirical analyses focused on stock exchange indexes, whereas separate time series for particular stocks are less often analysed. It is true that the behaviour of a stock in encoded in the stock exchange index, merely by definition. On the other hand, it seems interesting to analyse the concrete stocks as the fundamental activity on a stock exchange is to trade the stocks. It should also be mentioned that the composition of a market index is changed from time to time. Moreover, the investor can trade on particular stocks, but a short-selling is not allowed, which significantly affects the situation. This constraint is relaxed for index contracts, but the transaction durations of an index contract are not meaningful for the behaviour of durations of a particular stock. All in all, it seems very reasonable to analyse some concrete portfolio of stocks.

In this research 20 selected stocks from the Warsaw Stock Exchange were analysed: ALIOR, ASSECOPOL, BOGDANKA, BZWBK, EUROCASH, JSW, KERNEL, KGHM, LOTOS, LPP, MBANK, ORANGEPL, PEKAO, PGE, PGNIG, PKNORLEN, PKOBP, PZU, SYNTHOS and TAURONPE. These stocks constituted WIG 20 index in the end of 2014. WIG 20 is composed of 20 largest stocks from the Warsaw Stock Exchange. No more than 5 stocks out of a particular market sector can be included in it, nor can an investment fund be included in it (GPW, 2015). The tick data were obtained from BOŚ (2015). Table 1. presents the number of observations for particular time series. The date of the last observation is March 5, 2015 for all analysed stocks.

The computational part was done in R (Gentleman and Ihaka, 1996; R Core Team, 2014) with a help of "highfrequency" (Boundt et al., 2014) and "rugarch" (Ghalanos, 2014) packages.

If not stated otherwise, the 5% significance level was assumed.

Table 1.: Data details

Stock name	Day of first observation	
ALIOR	14/12/12	172954
ASSECOPOL	28/10/05	610690
BOGDANKA	22/07/09	320374
BZWBK	25/06/01	866861
EUROCASH	04/02/05	382480
JSW	06/07/11	599300
KERNEL	23/11/07	368693
KGHM	17/11/00	3847988
LOTOS	09/06/05	1064840
LPP	16/05/01	128928
MBANK	26/11/13	140587
ORANGEPL	14/01/14	197071
PEKAO	17/11/00	2026850
PGE	15/12/09	1202889
PGNIG	20/10/05	1416429

Stock name	Day of first observation	
PKNORLEN	17/11/00	2361739
PKOBP	10/11/04	3086038
PZU	12/05/10	1343152
SYNTHOS	02/11/07	491488
TAURONPE	30/06/10	661875

Source: Own elaboration.

4. RESULTS

First, the mentioned Diamond and Verrecchia (1987) hypothesis was tested for the unadjusted durations. The results are presented in Table 2. It presents the correlation between price changes and durations. The correlation was checked by the Pearson coefficient. It can be seen that the correlation occurred to be statistically significant at 5% level only in just a bit more than a half of the stocks. But if it happened to be significant, then (in 73% of such cases) it was negative, as predicted by Diamond and Verrecchia (1987). Nevertheless, it has to be mentioned that in some cases a significant positive correlation was found, but such a behaviour is rather unusual according to the analysed data.

Table 2.: Price change and duration correlation

Stock name	Correlation	P-value
ALIOR	0.0041	0.0863
ASSECOPOL	0.0024	0.0648
BOGDANKA	0.0010	0.5564
BZWBK	0.0005	0.6362
EUROCASH	-0.0100	0.0000
JSW	0.0063	0.0000
KERNEL	-0.0097	0.0000
KGHM	-0.0018	0.0003
LOTOS	0.0007	0.4618
LPP	0.0029	0.2953
MBANK	-0.0124	0.0000
ORANGEPL	-0.0091	0.0001
PEKAO	-0.0009	0.2059
PGE	-0.0023	0.0106
PGNIG	-0.0162	0.0000
PKNORLEN	-0.0003	0.6810
PKOBP	0.0018	0.0013
PZU	-0.0050	0.0000
SYNTHOS	-0.0005	0.7482
TAURONPE	0.0058	0.0000

Source: Own elaboration.

Table 3. presents the results of testing the first lag autocorrelations for price changes and logarithmic returns. Similarly as claimed by the already cited literature sources, in every analysed case the correlation was found negative and statistically significant.

Table 3.: First lag autocorrelations of price changes and logarithmic returns

Stock name	Price change autocorrelation	P-value	Log returns autocorrelation	P-value
ALIOR	-0.2289	0.0000	-0.2307	0.0000
ASSECOPOL	-0.0611	0.0000	-0.1391	0.0000
BOGDANKA	-0.2480	0.0000	-0.2475	0.0000
BZWBK	-0.3411	0.0000	-0.3614	0.0000
EUROCASH	-0.2493	0.0000	-0.2565	0.0000
JSW	-0.2698	0.0000	-0.2536	0.0000
KERNEL	-0.2487	0.0000	-0.2473	0.0000
KGHM	-0.3090	0.0000	-0.3463	0.0000
LOTOS	-0.2569	0.0000	-0.2517	0.0000
LPP	-0.2466	0.0000	-0.2002	0.0000
MBANK	-0.4184	0.0000	-0.4176	0.0000
ORANGEPL	-0.2843	0.0000	-0.2853	0.0000
PEKAO	-0.2888	0.0000	-0.2961	0.0000
PGE	-0.2855	0.0000	-0.2829	0.0000
PGNIG	-0.3861	0.0000	-0.3958	0.0000
PKNORLEN	-0.2910	0.0000	-0.3251	0.0000
PKOBP	-0.3150	0.0000	-0.3276	0.0000
PZU	-0.3338	0.0000	-0.3358	0.0000
SYNTHOS	-0.0106	0.0000	-0.0669	0.0000
TAURONPE	-0.3548	0.0000	-0.3527	0.0000

Source: Own elaboration.

Table 4.: Correlations of trading volume with other indicators

Stock name	Durations	P-value	De-seasonalised durations	P-value	Log returns	P-value	First lag trading volume autocorrelation	P-value
ALIOR	0.0376	0.0000	0.0443	0.0000	-0.0237	0.0000	0.0696	0.0000
ASSECOPOL	0.0240	0.0000	0.0430	0.0000	-0.0008	0.5580	0.0278	0.0000
BOGDANKA	0.0200	0.0000	0.0240	0.0000	-0.0043	0.0139	0.0317	0.0000
BZWBK	0.0217	0.0000	0.0173	0.0000	0.0016	0.1435	0.0623	0.0000
EUROCASH	0.0552	0.0000	0.0577	0.0000	-0.0099	0.0000	0.0460	0.0000

Stock name	Durations	P-value	Deseasonalised durations	P-value	Log returns	P-value	First lag trading volume autocorrelation	P-value
JSW	0.0406	0.0000	0.0553	0.0000	0.0103	0.0000	0.0108	0.0000
KERNEL	0.0262	0.0000	0.0336	0.0000	-0.0197	0.0000	0.0139	0.0000
KGHM	0.1414	0.0000	0.1891	0.0000	-0.0031	0.0000	0.0500	0.0000
LOTOS	0.0647	0.0000	0.0846	0.0000	-0.0005	0.6161	0.0688	0.0000
LPP	0.0345	0.0000	0.0347	0.0000	0.0115	0.0000	0.2574	0.0000
MBANK	0.0950	0.0000	0.1790	0.0000	-0.0369	0.0000	0.0476	0.0000
ORANGEPL	0.0789	0.0000	0.1196	0.0000	-0.0013	0.5598	0.0175	0.0000
PEKAO	0.1042	0.0000	0.1567	0.0000	-0.0015	0.0338	0.0611	0.0000
PGE	0.1112	0.0000	0.1559	0.0000	0.0244	0.0000	0.1090	0.0000
PGNIG	0.1207	0.0000	0.1336	0.0000	0.0060	0.0000	0.1171	0.0000
PKNORLEN	0.1173	0.0000	0.1338	0.0000	0.0066	0.0000	0.0548	0.0000
PKOBP	0.1752	0.0000	0.2202	0.0000	-0.0002	0.7421	0.0546	0.0000
PZU	0.1325	0.0000	0.1315	0.0000	0.0215	0.0000	0.0314	0.0000
SYNTHOS	0.0088	0.0000	0.0150	0.0000	-0.0008	0.5914	0.0026	0.0635
TAURONPE	0.0741	0.0000	0.1030	0.0000	0.0092	0.0000	0.0677	0.0000

Source: Own elaboration.

In every case the correlation of the trading volume and the duration is positive and statistically significant. This is consistent with previously cited references. The same relationship holds, if deseasonalised durations are considered. On the other hand, there is no clear relationship between the trading volume and logarithmic returns. The correlation is statistically significant in 70% of analysed stocks. In 7 cases a statistically significant negative correlation was found. In 7 cases a statistically significant positive correlation was found. Therefore, it seems that there is no definite relationship between returns and the trading volume. On the other hand, in every case a positive first lag autocorrelation of the trading volume was found. This is consistent with the already cited references. Only in one case this relationship was not found statistically significant at 5% significance level. But if 10% level is assumed, then the relationship is statistically significant for every analysed stock.

Consistently with the cited references it was also checked if the significance of ARCH effects for logarithmic returns possibly vanishes within some intervals. It was found that significant ARCH effects are present for 5 min., 10 min., 15 min., 30 min. and 1 hour intervals for every analysed stock. The result are presented in Table 5.

Table 5.: P-values of LM ARCH effects test

Stock name	5 min	10 min	15 min	30 min	60 min
ALIOR	0.0000	0.0000	0.0000	0.0000	0.0000
ASSECOPOL	0.0000	0.0000	0.0000	0.0000	0.0000
BOGDANKA	0.0000	0.0000	0.0000	0.0000	0.0000
BZWBK	0.0000	0.0000	0.0000	0.0000	0.0000
EUROCASH	0.0000	0.0000	0.0000	0.0000	0.0000
JSW	0.0000	0.0000	0.0000	0.0000	0.0000
KERNEL	0.0000	0.0000	0.0000	0.0000	0.0000
KGHM	0.0000	0.0000	0.0000	0.0000	0.0000
LOTOS	0.0000	0.0000	0.0000	0.0000	0.0000
LPP	0.0000	0.0000	0.0000	0.0000	0.0000
MBANK	0.0000	0.0000	0.0000	0.0000	0.0000
ORANGEPL	0.0000	0.0000	0.0000	0.0000	0.0000
PEKAO	0.0000	0.0000	0.0000	0.0000	0.0000
PGE	0.0000	0.0000	0.0000	0.0000	0.0000
PGNIG	0.0000	0.0000	0.0000	0.0000	0.0000
PKNORLEN	0.0000	0.0000	0.0000	0.0000	0.0000
PKOBP	0.0000	0.0000	0.0000	0.0000	0.0000
PZU	0.0000	0.0000	0.0000	0.0000	0.0000
SYNTHOS	0.0000	0.0000	0.0000	0.0000	0.0000
TAURONPE	0.0000	0.0000	0.0000	0.0000	0.0000

Source: Own elaboration.

Following Engle (2000) who proposed to consider time-adjusted returns, logarithmic returns were divided by the square root of the duration interval time. Such returns were checked for the existence of ARCH effects. Only in three cases no significant ARCH effects were found. However, for the majority of the analysed stocks such effects were statistically significant. The results are presented in Table 6. As a result, it was justified to perform UHF-GARCH analysis for these stocks, as described by Eqs (5) - (7).

Table 6.: Results of LM ARCH effects test for time-adjusted returns

Stock name	Statistic	P-value
ALIOR	3.3066	0.9930
ASSECOPOL	0.0024	1.0000
BOGDANKA	44.8897	0.0000
BZWBK	594.6586	0.0000
EUROCASH	692.7784	0.0000
JSW	286.5236	0.0000
KERNEL	334.7558	0.0000
KGHM	74.3607	0.0000

Stock name	Statistic	P-value
LOTOS	54.5645	0.0000
LPP	28.1457	0.0053
MBANK	9413.2983	0.0000
ORANGEPL	87.5038	0.0000
PEKAO	135.2232	0.0000
PGE	478.2346	0.0000
PGNIG	1356.6808	0.0000
PKNORLEN	106.0851	0.0000
PKOBP	360.1966	0.0000
PZU	62.4195	0.0000
SYNTHOS	0.0000	1.0000
TAURONPE	110.2270	0.0000

Source: Own elaboration.

UHF-GARCH models were estimated according to Eqs (5) - (7). Of course, for the previously mentioned three cases with no significant ARCH effects the UHF-GARCH model was not estimated. The results are presented in Tables 7. and 8. In Table 7. there are estimated coefficients of Eqs (5) - (7) and in Table 8. the corresponding p-values indicating t-test that these coefficients are indeed not equal to zero. The parameter c in Eq. (5) for every stock was set to 0 (i.e., models without mean were estimated). In addition, in Table 7. there are p-values from LM test checking whether there remain any significant ARCH effects in standardized residuals. In all cases there are no remaining ARCH effects, meaning that GARCH(1,1) specification was enough.

It is interesting to notice that the estimated coefficients for GARCH equations are similar amongst different stocks. The coefficients of UHF-GARCH models are quite similar to the ones of Będowska-Sójka and Kliber (2010). On the other hand, values of w in Eq. (7) are much smaller than those found by Sokalska (2012). In this context the paper of Strawiński and Ślepaczuk (2008) is also interesting. They analysed high frequency data from WIG20 index futures in the context of efficient market hypothesis.

Table 7.: Estimated coefficients of UHF-GARCH and LM test for residuals

Stock name	f	g	w	a	b	LM test
BOGDANKA	0.0219	-0.1164	0.0000	0.0552	0.9417	1.0000
BZWBK	-0.1246	-0.1205	0.0000	0.0436	0.9461	0.9959
EUROCASH	-0.0708	-0.0595	0.0000	0.0188	0.9772	1.0000
JSW	-0.0301	-0.1457	0.0000	0.0562	0.9104	1.0000
KERNEL	-0.0714	-0.0687	0.0000	0.0542	0.9286	1.0000
KGHM	-0.1223	-0.1522	0.0000	0.0576	0.9110	1.0000
LOTOS	-0.0259	-0.1782	0.0000	0.0531	0.9217	1.0000
LPP	-0.0770	-0.0688	0.0000	0.0123	0.9844	0.9993

Stock name	f	g	w	a	b	LM test
MBANK	-0.3497	0.0207	0.0000	0.0502	0.9295	1.0000
ORANGEPL	-0.1675	-0.0406	0.0000	0.0598	0.9134	1.0000
PEKAO	-0.0795	-0.0798	0.0000	0.0565	0.9130	0.9998
PGE	-0.0495	-0.1362	0.0000	0.0659	0.9099	1.0000
PGNIG	-0.0686	-0.2251	0.0000	0.0393	0.9455	0.9892
PKNORLEN	-0.0549	-0.1224	0.0000	0.0550	0.9102	0.9989
PKOBP	-0.0206	-0.2270	0.0000	0.0566	0.9096	1.0000
PZU	-0.1253	-0.2020	0.0000	0.0620	0.9114	1.0000
TAURONPE	-0.0595	-0.2368	0.0000	0.0572	0.9166	1.0000

Source: Own elaboration.

Table 8.: P-values of estimated coefficients of UHF-GARCH

Stock name	f	g	w	a	b
BOGDANKA	0.6494	0.0164	0.5367	0.0000	0.0000
BZWBK	0.0000	0.0000	0.2586	0.0000	0.0000
EUROCASH	0.0000	0.0003	0.6150	0.0000	0.0000
JSW	0.0001	0.0000	0.6382	0.0000	0.0000
KERNEL	0.0084	0.0084	0.4381	0.0000	0.0000
KGHM	0.0000	0.0000	0.2995	0.0000	0.0000
LOTOS	0.0000	0.0000	0.4940	0.0000	0.0000
LPP	0.0070	0.0148	0.8787	0.0000	0.0000
MBANK	0.0000	0.0000	0.6067	0.0000	0.0000
ORANGEPL	0.0000	0.0026	0.5584	0.0000	0.0000
PEKAO	0.0000	0.0000	0.5612	0.0000	0.0000
PGE	0.1831	0.0002	0.9243	0.0000	0.0000
PGNIG	0.0000	0.0000	0.1860	0.0000	0.0000
PKNORLEN	0.0000	0.0000	0.3649	0.0000	0.0000
PKOBP	0.0000	0.0000	0.5886	0.0000	0.0000
PZU	0.0000	0.0000	0.7272	0.0000	0.0000
TAURONPE	0.0000	0.0000	0.4855	0.0000	0.0000

Source: Own elaboration.

From Table 8. it can be seen that estimated MA coefficient in ARMA equation was statistically significant for every stock. On the other hand, AR term was not statistically significant in two cases. Statistical non significance of constant term in variance equation for every stock is not problematic. As seen from Table 7. this coefficient should be assumed equal to zero. The other terms in variance equation are statistically significant for every analysed stock.

Table 9. presents the coefficients of HAR model, i.e., the one given by Eqs (8) and (4). Also, adjuster R-squared coefficients are given. For two stocks adjusted R-squared coefficient is very low. It indicated that HAR model in these cases poorly

fits the data. In a few cases this coefficient is quite high (JSW, KGHM, PEKAO, PGE, PKNORLEN, PKOBP, SYNTHOS). For these stocks HAR model can quite reasonably describe the real data. For every stock the constant term is quite small. In most cases the coefficient representing weekly realized volatility is significantly higher than the one representing the daily volatility. Yet, in many cases the coefficient representing monthly volatility is smaller even that the one for daily variance. This ca be a sign that after one month the market "forgets" about price fluctuations.

Table 9.: Estimated coefficients of HAR model and adjusted R-squared coefficients

Stock name	c0	c1	c2	c3	Adj. R-squared
ALIOR	0.0010	0.0141	0.0559	0.0241	0.0000
ASSECOPOL	0.0024	0.0059	0.0066	-0.0063	0.0010
BOGDANKA	0.0003	0.2480	0.4104	0.0503	0.2572
BZWBK	0.0003	0.2016	0.2946	0.3577	0.3140
EUROCASH	0.0006	0.1074	0.3022	0.2440	0.1137
JSW	0.0002	0.4229	0.3375	0.0442	0.4473
KERNEL	0.0007	0.0921	0.2490	0.3408	0.1023
KGHM	0.0002	0.2337	0.4331	0.2228	0.4664
LOTOS	0.0003	0.1482	0.3385	0.2791	0.2068
LPP	0.0003	0.1087	0.2683	0.3344	0.1339
MBANK	0.0006	0.3231	0.0644	0.2182	0.1438
ORANGEPL	0.0005	0.3305	0.0673	0.1104	0.1580
PEKAO	0.0001	0.2119	0.4573	0.2115	0.4369
PGE	0.0002	0.3739	0.4069	0.0390	0.4530
PGNIG	0.0005	0.1888	0.3697	0.2162	0.2463
PKNORLEN	0.0001	0.3640	0.2597	0.2626	0.4697
PKOBP	0.0001	0.2462	0.4758	0.1694	0.5192
PZU	0.0001	0.1586	0.5533	0.1003	0.3483
SYNTHOS	0.0003	0.3140	0.5702	0.0005	0.6085
TAURONPE	0.0004	0.3780	0.3156	0.0069	0.3243

Source: Own elaboration.

Table 10. presents p-values for the coefficients from Table 9. The great majority of the estimated coefficients for HAR models are statistically significant.

Table 10.: P-values for estimated coefficients of HAR model

Stock name	c0	c1	c2	c3
ALIOR	0.0000	0.7746	0.6365	0.9120
ASSECOPOL	0.0309	0.7991	0.9089	0.9540
BOGDANKA	0.0000	0.0000	0.0000	0.4021
BZWBK	0.0000	0.0000	0.0000	0.0000
EUROCASH	0.0000	0.0000	0.0000	0.0000

Stock name	c0	c1	c2	c3
JSW	0.0004	0.0000	0.0000	0.4446
KERNEL	0.0000	0.0008	0.0000	0.0000
KGHM	0.0000	0.0000	0.0000	0.0000
LOTOS	0.0000	0.0000	0.0000	0.0000
LPP	0.0000	0.0000	0.0000	0.0000
MBANK	0.0125	0.0000	0.5943	0.1786
ORANGEPL	0.0005	0.0000	0.5530	0.4605
PEKAO	0.0000	0.0000	0.0000	0.0000
PGE	0.0000	0.0000	0.0000	0.4062
PGNIG	0.0000	0.0000	0.0000	0.0000
PKNORLEN	0.0000	0.0000	0.0000	0.0000
PKOBP	0.0000	0.0000	0.0000	0.0000
PZU	0.0001	0.0000	0.0000	0.0861
SYNTHOS	0.0000	0.0000	0.0000	0.5612
TAURONPE	0.0000	0.0000	0.0000	0.9097

Source: Own elaboration.

5. CONCLUSIONS

The empirical properties of the high-frequency data of 20 selected stocks from the Warsaw Stock Exchange (in particular the ones listed on WIG 20) were examined. In every case a large amount of data was analysed. All analysed data were intraday one.

It was found that in many cases there is a significant negative correlation between price change and duration. The stylized facts of negative first lag autocorrelation of price change and logarithmic returns were also confirmed.

In case of trading volume it was found that it is significantly positively correlated with durations. There is also a positive significant first lag autocorrelation. On the other hand, the relationship between the reading volume and logarithmic returns is inconclusive. For some stocks it is significantly positive, but some significant and negative. It seems therefore interesting, for the future researches, to include in the considerations larger sample. In other words, to consider the analysis basing on more stocks. As the Warsaw Stock Exchange is expanding and with a time more data are collected, this should be possible.

ARCH effects are present for every analysed stock. However, the UHF-GARCH model could be constructed only for 85% of the considered stocks. The outcomes were quite similar for every stock. GARCH(1,1) specification for the variance equation was enough in every case.

The HAR model was also estimated. In many cases quite high R-squared coefficient was obtained. Both AR(1)MA(1)-GARCH(1,1) and HAR models had statistically significant coefficients in most cases.

Although the already applied methods are based in the specific econometric modelling, i.e., suitable to catch the high-frequency properties; the core methodology is still well grounded in the conventional econometric theory. Nevertheless, still some kind of a drawback can erase, if the forecasting would be the only aim. The conclusions derived in this paper base on the analysis of the whole available data sample. In reality, the market player can only use the past information; but can update his or her state of knowledge as the new information arrives on the market. In this context the Bayesian econometrics and conventional, but recursive and rolling window approaches, might be worth to consider. However, they were yet not applied much in a joint way with the concept of high-frequency data. Therefore, for the future researches such a combination could be interesting (Du et al., 2016).

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VALUE ADD FINANCIAL MEASURES USED BY GERMAN DAX 30 CORPORATIONS AS PART OF HIGHLY PROFESSIONALIZED CORPORATE GOVERNANCE MANAGEMENT

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ABSTRACT

Purpose. *This research paper shows which value add measures are used by German DAX 30 corporations in their 2015 annual reports. It explains how different measures like shareholder value, economical value add (EVATM), return on capital employed (ROCE), return on equity (ROE) and others are calculated and how they correlate. Corporate governance has been highly professionalized which clearly shows in the annual reports of all firms. The requirement for "sustainable creation of value" as stated in the German Corporate Governance Codex (Regierungskommision Deutscher Corporate Governance Kodex, 2015) is made transparent as a core element in the companies' annual reports.*

Design. *70% of the DAX30 firms show value add data and some of them even highlight that value add has been made part of their corporate management approach. In turn this means that 30% of the firms are not showing value add data in a prominent way. The paper focuses on the 70% showing value add data and how EVA, company specific EVA-like measures or ROCE are the most used ones.*

Findings. *The paper shows that ROCE with a factor of 0,97 correlates best with EVA and in absence of an EVA calculation is the best measure to represent value creation.*

Originality. *As part of a dissertation the aim is to develop a best in class measurement system and comparison for corporate governance theoretical and empirical analyses. The paper has been presented at 21st European Scientific Conference of Doctoral Students - PEFnet2017 organized by the Faculty of Business and Economics of Mendel University in Brno, taking place on November 30, 2017 on the campus of Mendel University in Brno, Czech Republic.*

1. INTRODUCTION

The objective of the first theoretical part of this paper is to identify and analyze financial measures against their usefulness to show financial value added as part of professionalizing corporate governance. The second part's objective is to show, analyze and discuss which financial measures are actually used by the German DAX 30 corporations. An additional intention is to provide inputs from the learnings of this research to members of the board of directors or supervisory boards.

Claessens and Yurtoglu (2013) review research on corporate governance, with a special focus on emerging markets (Claessens, Yurtoglu, 2013). Claessens and Yurtoglu (2013) find that better corporate governance benefit firms through greater access to financing, lower cost of capital, better performance, and more favorable treatment of all stakeholders (Claessens, Yurtoglu, 2013). Lazonick and O'Sullivan (2000) provide an historical analysis of the rise of shareholder value as a principle of corporate governance, Lazonick and O'Sullivan (2000) consider the performance of the US economy, and raise questions about the relation between the maximization of shareholder value and the sustainability of economic prosperity (Lazonick, O'Sullivan, 2000).

Khan et. al., (2013) examine the relationship between corporate governance and the extent of corporate social responsibility (CSR) disclosures (Khan et. al., 2013). Khan et. al., (2013) results suggest that although CSR disclosures generally have a negative association with managerial ownership, such relationship becomes significant and positive for export-oriented industries (Khan et. al., 2013), (Michalski, 2016). Aguilera and Jackson (2003) develop a theoretical model to describe and explain variation in corporate governance among advanced capitalist economies (Aguilera, Jackson, 2003). Model of (Aguilera, Jackson, 2003) has strong implications for studying issues of international convergence (Aguilera, Jackson, 2003).

Liu and Zhang (2017) take Chinese companies in heavy-pollution industries the relationships among corporate governance, social responsibility information disclosure, and enterprise value (Liu, Zhang, 2017). (Liu, Zhang, 2017) find that there is a declining level of social responsibility information disclosure of listed enterprises in heavy-pollution industries (Liu, Zhang, 2017). Forbes and Milliken (1999) develop a model of board processes by integrating the literature on boards of directors with the literature on group dynamics and workgroup effectiveness (Forbes, Milliken, 1999).

Croci et. al., (2017) examine minority squeeze-outs and their regulation in Germany. According to Croci et. al., (2017) carry out the first detailed analysis of the German squeeze-out offers from the announcement to the outcome of post-deal litigation. Croci et. al., (2017) claim that large firms with foreign large shareholders are the most likely to be delisted (Croci et. al., 2017). Baysinger and Butler (1985) examined role of the board of directors in the theory of the firm and argue that the recognition of the governance and instrumental functions of individual

directors is an important element in developing a theory of corporate governance (Baysinger, Butler, 1985)

Al-Najjar, (2017) investigates the impact of board and CEO characteristics on CEO compensation (Al-Najjar, 2017). (Al-Najjar, 2017) indicate that board size, board independence and CEO age are important factors affecting CEO pay (Al-Najjar, 2017). Daily et. al., (2003) claims the field of corporate governance is at a crossroads (Daily et. al., 2003).

Nuthall and Old (2017) observe that family farming has been the dominant ownership and governance system in primary production. Nuthall and Old (2017) hypothesised that the farmers' personal characteristics play a major part in the choice, and continuance, of current ownership and governance systems. Core et. al. (1999) find that measures of board and ownership structure explain a significant amount of cross-sectional variation in CEO compensation and (Core et. al., 1999) suggest that CEOs earn greater compensation when governance structures are less effective. (Core et. al., 1999) find that firms with weaker governance structures have greater agency problems and greater compensation is paid to CEOs at firms with greater agency problems (Core et. al., 1999).

La Porta et. al. (2000) describe the differences in laws and the effectiveness of their enforcement across countries (La Porta et. al., 2000), they also assess potential strategies of corporate governance reform. La Porta et. al. (2000) argue that the legal approach is a more fruitful way to understand corporate governance (La Porta et. al., 2000). Shleifer and Vishny (1997) surveyed research on corporate governance, with special attention to the importance of legal protection of investors and of ownership concentration in corporate governance systems around the world (Shleifer, Vishny 1997). In similar manner (Shleifer, Vishny, 2007) surveyed research on corporate governance, with special attention to the importance of legal protection of investors and of ownership concentration in corporate governance systems around the world (Shleifer, Vishny, 2007).

Liu et. al., (2017) find that the media can play a role in corporate governance by influencing the value of CEOs' human capital (Liu et. al., 2017). Jensen and Meckling (1976) integrates elements from the theory of agency, the theory of property rights and the theory of finance to develop a theory of the ownership structure of the firm (Jensen, Meckling, 1976). They define the concept of agency costs, show its relationship to the control and separation issue, (Jensen, Meckling, 1976) made research on the nature of the agency costs generated by the existence of debt and outside equity. Apart from that Jensen and Meckling (1976) demonstrate who bears costs agency and investigate the Pareto optimality of existence agency costs during corporate governance process (Jensen, Meckling, 1976).

Kalodimos (2017) found that the effect of internal governance on performance is potentially economically significant but may be difficult to identify. Kalodimos (2017) claims that there is a case because of confounding external disciplinary mech-

anisms and the endogenous choice of internal governance (Kalodimos, 2017). Study of Kalodimos (2017) addresses those difficulties by using nonprofit (Svidroňová et. al., 2016) hospitals (Soltes, Gavurova, 2016) as an economic environment with muted external disciplinary mechanisms and instrumenting for internal governance using governance spillovers of geographically local public firms (Kalodimos, 2017). Gompers et. al. (2003) constructed a Governance Index by which they defined the level of shareholder rights at large firms. Gompers et. al. (2003) have found that investment strategy that bought firms to situation with strongest rights. In opposite manner sold firms were found as these which have weakest rights. That second group would have earned abnormal returns of 8.5 percent per year during the sample period. Gompers et. al. (2003) have found that firms with stronger shareholder rights had higher firm value growth and lower capital expenditures (Gompers et. al., 2003).

Hayat and Kabir Hassan, (2017) study the effect of an Islamic label on corporate governance. According to observation of Hayat and Kabir Hassan (2017) listed firms with an Islamic label are characterized by low leverage (Hayat, Kabir Hassan 2017). If leverage can act as a substitute for good governance according to Hayat, Kabir Hassan (2017), and it means to them that it is basis for expectation that these Islamic firms will have better governance than their non-Islamic peers (Hayat, Kabir Hassan 2017), although there is no significant difference in overall governance between Islamic and non-Islamic firms (Hayat, Kabir Hassan 2017). and there is no significant effect of an Islamic label. Hayat and Kabir Hassan (2017) find that an Islamic label adds to governance quality, as measured by the score, but that is effect rather political correctness wishing thinking but not related to leverage or real differencess (Hayat, Kabir Hassan 2017).

Corporate governance has become more and more important over the past 15 years. Following local corporate governance guidelines and codices has become a de facto standard. This is made fully transparent in annual and corporate governance reports in today's world of stock market listed firms. On top of that more and more firms not only document compliance, they use certain financial measures to make transparent their success of adding value to the company. Having stated that the immediate question arises which is the most appropriate approach and which financial measures are best suited to reflect value add. While shareholder value in the meantime has a somewhat negative touch in the sense of being short-term and capital focused only, Economic Value Added (EVA) ™ seems to be the best known and often used measure applied by firms in recent years. The author believes that while EVA ™ on the one hand side is well if not best suited but on the other hand due to its constraints has limitations. Therefore, that's the hypothesis, there is not one consistent metric used between the firms yet.

Corporate governance was institutionalized in the early 2000's in several countries like in the United States with the Sarbanes-Oxley-Act 2002 ("Sarbanes-Oxley Act," 2002) or in Germany with the German Corporate Governance Codex (GCGC).

The Sarbanes-Oxley Act of 2002 (often shortened to SarbOx or SOX) is a legislation passed by the U.S. Congress to protect shareholders and the general public from accounting errors and fraudulent practices in the enterprise, as well as improve the accuracy of corporate disclosures. The U.S. Securities and Exchange Commission (SEC) administers the act, which sets deadlines for compliance and publishes rules on requirements. The German Corporate Governance Code " …. presents essential statutory regulations for the management and supervision (governance) of German listed companies and contains internationally and nationally recognized standards for good and responsible governance. The Code aims to make the German Corporate Governance system transparent and understandable. Its purpose is to promote the trust of international and national investors, customers, employees and the general public in the management and supervision of listed German stock corporations.

The Code clarifies the obligation of the Management Board and the Supervisory Board to ensure the continued existence of the enterprise and its sustainable creation of value in conformity with the principles of the social market economy (interest of the enterprise).

A dual board system is prescribed by law for German stock corporations." Furthermore "The Code clarifies the obligation of the Management Board and the Supervisory Board to ensure the continued existence of the enterprise and its sustainable creation of value in conformity with the principles of the social market economy (interest of the enterprise)."(Regierungskommision Deutscher Corporate Governance Kodex, 2015)

This paper focuses on the so called "sustainable creation of value" and especially how it can be measured from a financial point of view.

Already in the mid nine-tees of the previous century Joel Stern developed the Economical Value Added (EVA)™ approach (Joel Stern et al., 1996) which was trademarked by Stern Stewart & Co. This measure has been adopted by many companies ever since, however there are several other financial measures which are being used and need to be considered in this context.

In this paper in the first step different financial measures EVA ™ are being identified, explained and evaluated including literature search. Other considered financial measures besides EVA ™ are without particular order Shareholder Value, Return On Assets ROA, Return On Net Assets RONA, Return On Equity ROE, Return On Capital Employed ROCE, Return on Investment ROI, Cash flow, free cash flow, Tobin's Q as well as Financial Value Add and Value Add.

In a second step the annual reports of some of the German DAX listed corporations are evaluated in order to find out whether a financial value add measure is used and if so which one it is.

Thereafter these measures are being discussed before a future outlook from the author concludes the paper.

2. FINANCIAL MEASURES

The paper aims to judge financial measures towards their usefulness for the corporate governance objective to grow the financial value of a firm in a sustainable way. It intends to take the view from a board of director's member who's duty is to make sure value is added. It is not meant to provide a complete analysis of financial measures used in corporate balance sheets. Also the author takes it as common knowledge that a singular financial measure cannot be reflective of the financial health of a company, which means even with a proper financial value add measure additional financial indicators need to be considered in order to get a full picture and judgement of a firm's financial constitution at any given time (Becker, 2013; Brealey et al., 2015; Wöhe, 2016).

2.1. Economical Value Added EVA ™

As mentioned before EVA ™ has been developed by Joel Stern and trademarked by Stern Stewart & Co. Stern raises high expectations stating that " … EVA … is not just a performance measure. When fully implemented it is the centerpiece of an integrated financial management system that encompasses the full range of corporate financial decision making …. ." (Joel Stern et al., 1996). While it might be a bit ambitious it at least has made its way into many corporate finance departments and boards as measure and indicator for financial value add throughout the years until today which we will see in the empirical research later in this paper. Another author in an article claims "Economic value added (EVA) uses accounting information to improve decisions and motivate employees."(unknown, 2008), furthermore Joel Stern emphasizes "EVA is not a metric but a way of thinking, a mindset." (Joel Stern et al., 1996)

German Professor Stefan Hilbert in an article xx says that while the shareholder value approach in principle is well suited as corporate management instrument, it has constraints as it is rather mathematical and difficult to communicate (Hilbert, n.d.). Therefore, he claims that EVA ™ as the more practical approach has been more successful.

2.2. EVA calculation

EVA=(ROCE-WACC)xNOA (1)
alternatively
EVA=(NOPAT-WACC)xNOA (2)
in which
ROCE = Return On Capital Employed
WACC = Weighted Average Cost of Capital

NOA = Net Operating Assets

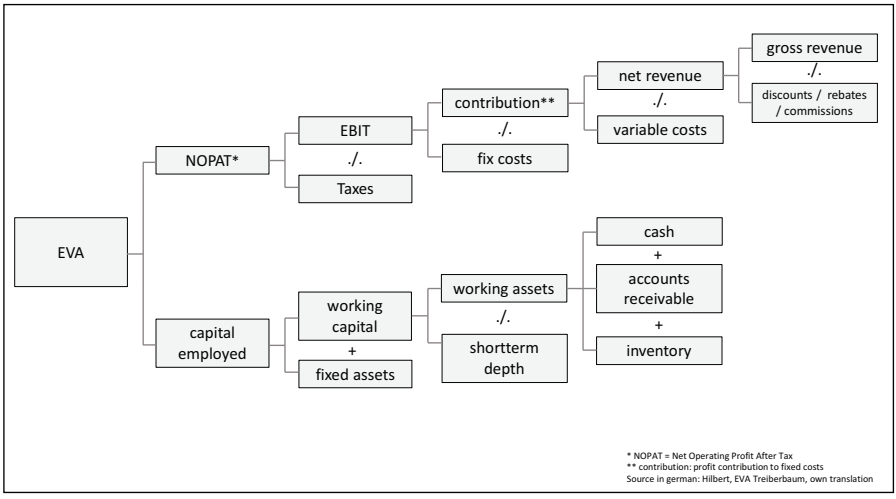
NOPAT = Net Operating Profit after Taxes

The delta between ROCE and WACC is the so called spread which if positive says that value was created, as then the return of the employed capital was higher than the costs to finance. Prof.Hilbert cautions to simply use balance sheet data to calculate as it should be mandatory to use current market conditions for valuation to eliminate balance sheet effects for calculating asset values.

NOPAT is a company's potential cash earnings if it had no depth. Therefore, NOPAT is a more accurate look at operating efficiency for companies with depth, as it does not include the tax savings many companies get because of existing debt.

Nevertheless, EVA can be used as value based management system for a firm or even within a firm for individual business units to compare performance. In order to do so the so called EVA decision tree as shown in below graph 1 serves as a very transparent instrument.

Figure 1.: EVA decision tree



Source: Authors.

The downside of the EVA calculation and approach is that in order to boost EVA mid- to longterm investments can be reduced or abandoned resulting in short term actions and mindset with the risk of harming mid- and longterm term success. In addition the formula might show limited viability for companies with high intangible assets, such as small to mid-size high tech firms with several patents and high intellectual property (IP). Knowing these shortcomings EVA still might be of very good use and an instrument also for the board of directors or supervisory board in combination with additional means and measures. This could be for example the governed execution of a strategic plan ensuring a balanced approach between short-, mid- and longterm investments.

2.3. Shareholder value

Alfred Rappaport often is seen as intellectual founder of shareholder value (Rappaport, 1986). Already in 1983 he published " … the experience of companies that have implemented the shareholder value contribution criterion … is not only a conceptionally appealing performance standard, but a wholly operational one as well. …. Should improve companies opportunities for creating economic value …." (Rappaport, 1983)

With Jack Welch's increasing success as CEO of General Electric Corporation shareholder value became the synonym for financial success in corporate America in the 90's and early 2000's. In the meantime "…in vogue to dismiss the idea that creating shareholder value should be a CEO's guiding objective. " (Mauboussin, 2011): He says that it is "a profound misunderstanding" that shareholders value management is all about optimizing the stock price for the short term. In opposite it is " to create value and then let the stock price reflect the value" (Mauboussin, 2011). In his eyes "A CEO's job is about resource allocation …. figuring out how to allocate human and financial capital to its best and highest use for the long term. Value creation, by means of maximizing long-term free cash flow, provides the appropriate approach to judge alternative strategies and subsequent performance." There are two important points mentioned, one is the financial measure of long-term free cash flow, we come back to that shortly. The second one is value creation which he ties directly to long-term free cash flow. This explains why cash flow is one of the key financial measures and indicators (Dittmar and Mahrt-Smith, 2007). See also Hilbert's calculation of Shareholder Value (Hilbert, n.d.)

Shareholder value (SHV) is the value of a firm which is left at the end of a business cycle, after all debts have been paid. This money, the free cash flow(s) is for the shareholder(s). In financial terms it is the value of a company which is defined as the net present value (NPV) of all future cashflows plus the value of the non-operating assets of the company less the future claims (debts). Where non-operating assets include for example marketable securities like stocks, excess real estate, overfunded pension plans. Future claims are debts include for example short-term and long-term interest bearing debt, capital lease obligations, underfunded pension plans, contingent liabilities.

SHV=Corporate Value - Debts (future claims) (3)

or

SHV=(NPV+value of non - operating assets) debts (future claims) (4)

Shareholder value can be calculated using below formula

$$SHV = \sum_{t=1}^{n} = \frac{\pi t}{(1+i)t} = \frac{(R-C)t}{(1+i)t} \quad (5)$$

$$SHV = \sum_{t=1}^{n} = \frac{FCFt}{(1+i)t} + \frac{TV}{(1+i)n} - L \quad (6)$$

in which

t1/tn = current and future years

i = interest rated with which future profits / cash flows are discounted

Ʃ = (R-C)t = Profit = Revenue - Cost , in a given year

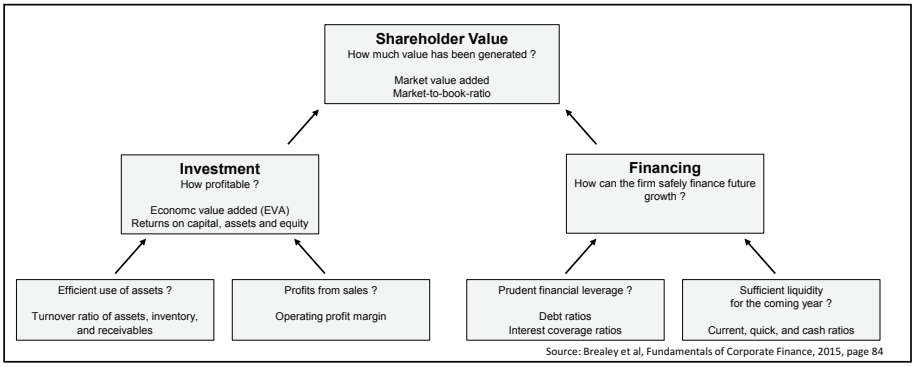
FCF = Future Cash Flow

TV = Terminal Value (firm value at end of period)

L = market value of Liabilities

Brealey et al in their book provide a more practical view on shareholder value and state that "shareholder value depends on good investment decisions" and " … on good financing decisions". Below figure taken from their book illustrates these two elements along with probing questings to ask (Brealey et al., 2015).

Figure 2.: Common financial ratios and other measures relate to shareholder value



Source: Authors.

Figure 2. shows how common financial ratios and other measures relate to shareholder value. Brealey et al, Fundamentals of Corporate Finance, 2015, page 84

Taking all of this into account it becomes obvious that shareholder value can be an excellent management approach, if its used to its advantage and not as the sole indicator of value add. If not used properly as a management guidance and bonus system for top management it may lead to short term optimization of cash flows to boost shareholder value while harming long term investments (Rieg, 2015). Being a full promoter of the shareholder value approach in his early publications in the 80's, Rappaport in his 2005 article states "Financial analysts fixate on quarterly earnings at the expense of fundamental research. Corporate executives … point to the behavious of the investment community to rationalize their own obsession with earnings. Short-termism is

the desease; earnings and tracking error are the carriers." (Rappaport, 2005). Also the calculation as such isn't as straight forward as it looks like in the formula. For instance future risks can and need to be built in by varying the interest factor i, which also reflects the uncertainty of future interest rates, therefore the factor i by itself could be the source for significant calculation deviations.

2.4. Cash flow and Free cash flow

"The value of a company depends on how much cash it can generate for investors after it has paid for any new capital investments. This cash is called … free cash flow. " (Brealey et al., 2015).

It is obvious that cash cash flows are a very important part, if not the most important one in defining and judging value add of a firm. As a matter of fact in a recent talk with a controller of a medium-sized german stock market listed and fast growing company, he said that cash flow is the key financial indicator for him. Below formula shows how cash flow from operations and free cash flow are calculated.

$$\begin{aligned} &EBIT - interest\ expense - taxes \\ &= net\ income + interest + depreciation - additions\ to\ net\ working\ capital \\ &= cash\ flow\ from\ operations - capital\ expenditures = free\ cash\ flow \end{aligned} \tag{7}$$

The importance of cash is also emphasized by Dittmar, Mahrt-Smith "Answer to question 'Does it matter if firms hold large cash reserves ?' is yes …" (Dittmar and Mahrt-Smith, 2007).

There seems to be also the unified agreement that corporate governance doesn't have much impact on how much cash is generated, that is clearly in the hand of the executives " … governance has a relatively minor impact on how firms accumulate cash, but a significant impact on how firms spend their money. " (Dittmar and Mahrt-Smith, 2007). However, the use of available cash seems to be indeed tight to the level of corporate governance of a firm "… . show that governance has a substantial impact on value through its impact on cash ….(Dittmar and Mahrt-Smith, 2007) Furthermore they state that "… $1.00 of cash in a poorly governed firm is value at only $ 0.42 to $ 0.88. Good governance approximately doubles this value." (Dittmar and Mahrt-Smith, 2007). Also interesting and at the same time not surprising are the findings of Harford "… shows that … firms with large cash reserves spend more on acquisitions" (Harford, 1999).

2.5. ROI/ROE/ROA/RONA/ROCE

EVA measures "how many dollars a business is earning after deducting the cost of capital." which means " the more assets a manager has to work with, the greater the opportunity to generate large EVA" (Brealey et al., 2015). Therefore, additional supporting measures are helpful. The most common ones among those are Return On Capital (ROC) or Return On Capital Employed (ROCE) or Return on Investment (ROI) and Return On Equity (ROE) ,a s well as Return On Assets (ROA) or Return On Net Assets (RONA).

Stiglbauer defines a set of five different financial criteria as endo-gene variables to reflect the correlation between corporate governance and corporate success (Stiglbauer, 2010a). These are Return On Equity (ROE), Return On Investment (ROI) as two balance sheet criteria, and two so-called hybrid criteria Tobin's Q and the market to book value of equity as well as one stock market related criteria which is return on stock.

Mäkelainen see's these measures critical " All accounting based rate of returns (ROI, RONA, ROCE, ROIC) fail to assess the true or economic return of a firm, because they are based on the historical asset values, which in turn are distorted by inflation and other factors. Stewart defines his rate of return as return on beginning capital and as return after taxes but these adjustments do not affect the problems attached to accounting rate of return. The shortcomings of accounting rate of returns and the current research on the subject are presented in detail in next section. The valuation formula of EVA, however is always equivalent to discounted cash flow and Net present value, if EVA is calculated as Stewart presents." (Mäkelainen, 1998).

2.6. ROC - Return on Capital

ROC is defined as (Brealey et al., 2015) net income plus after-tax interest as a percentage of long-term capital.

It is equal to after-tax operating income divided by total capitalization. Important to know is when calculating ROC a so-called flow measure (income over period of a year) is combined with a snapshot measure (capital at the start of the year). Therefore it may be a more accurate reflection of realities if the average of the total capitalization at the beginning and end of the year is taken.

2.7. ROA - Return on Assets

ROA is defined as net income plus after-tax interest as a percentage of total assets.

It measures after-tax operating income as a fraction of the firms total assets. Total assets equal total liabilities plus shareholders equity are greater than total capitalization because total capitalization does not include current liabilities.

2.8. ROE - Return on Equity

ROE s defined as income as a percentage of shareholders equity.

It measures the income to shareholders per Dollar they have invested. Again to ensure flow measures are used consistently it should be taken net income divided by average equity.

3. THE USE OF FINANCIAL VALUE ADD MEASURES IN PRACTICE - AN EMPIRICAL ANALYSIS OF THE 30 GERMAN DAX LISTED CORPORATIONS

In order to evaluate the use of financial measures in practice as part of this research, an empirical approach has been chosen. Analyzing 2015 annual reports of the 30 German DAX listed companies with the following objectives has been performed.

Objectives have been to:

(1) identify whether and which financial measures are used beyond the standard financial reporting needs in order to reflect financial return and value creation

(2) document the values of these measures by firm

(3) analyze and discuss measures and data

This empirical analysis is to set the basis for further research as part of a dissertation. Below two tables compile and summarize financial measures, first from the theoretical part of the paper and, second from the empirical research done. Table 1 takes financial measures and how these are calculated adding commentary to it on how its calculated or what advantages or limitations it might have. The fourth column then reflects in which 2015 annual report of the German DAX 30 corporations the respective measure is used, while the last column references literature which is used in this paper regarding these financial measures.

3.1. Results of empirical approach

The empirical research unvealed that most of the firms using a true value add measure beyond ROCE, ROE or ROA are using EVA or an EVA like calculation which in both cases they define as their own firm specific value add measure. Such examples are Continental Value Creation (CVC), ThyssenKrupp Value Added (tkVA) or Merck Economic Value Added (MEVA) or simply Financial Value Add (Daimler), Value Add(ed) (Bayer, BASF, BMW, EON) or Value Creation (Henkel). Table 2 shows which measure is used by which company, how its calculated and again commentary including whether its just a financial metric or value add is used and implemented as a management approach to compare different business units with each other or to

steer and measure management and teams towards value creation (Henkel, Continental).

Table 1.: Financial measures, calculations and use in German DAX30 firms

Financial Measures	calculation	comments	in 2015 annual report	Literature
Cash Flow (from Operations)	calculated as net income + interest + depreciation - additions to net working capital = cash flow from operations	The value of a company depends on how much cash it can generate.	Beiersdorf AG Annual Report 2015, page 49, also covers Net and Free Cash flows / Lufthansa Annual Report 2015, page 2 / SAP AG Annual Report 2015, page 136 / Bayer AG Annual Report 2015, page 3	compare: Dittmar, Mahrt-Smith 2005, pages 1 and 4 / Brealey et al, Fundamentals of Corporate Finance, 2015
Free Cash Flow	cash flow from operations - capital expenditures = free cash flow	The value of a company depends on how much cash it can generate for investors after it has paid for any new capital investments. This is called free cash flow.	Continental AG, Annual Report 2015, pages 2/13 / Henkel, AR 2015, page 74 / Software AG, Annual Report 2015, page 3	compare: Dittmar, Mahrt-Smith 2005, pages 1 and 4 / Brealey et al, Fundamentals of Corporate Finance, 2015
Economical Value Add (EVA)	EVA=NOPAT - WACC*NOA EVA=(ROCE - WACC)*NOA	EVA has been developed resulting from difficulties of ease of communication of the shareholder value add. EVA champions the idea a business is only profitable when it creates wealth and returns for shareholders, and requires performance above a company's cost of capital. The EVA calculation relies heavily on the amount of invested capital, and is best used for asset-rich companies that are stable or mature. Companies with intangible assets, such as technology businesses, may not be good candidates for an EVA evaluation.	Henkel AG, Annual Report 2015, page 71 / EON Annual Report 2015, page 50 / Merck Annual report 2015 MEVA page 60 / RWE Annual report 20165, page 54 / ThyssenKrupp Annual Report 2015, page 4	compare: Hilbert , Wertorientierte Unternehmensführung, pages 13 ff / Brealey et al, Fundamentals of Corporate Finance, 2015
ROA - Return on Assets	ROA = (Net income + after-tax interest) / total assets.	ROA is a measure to show how well a company uses the available assets and how much profit it is able to generate using these assets	Fresenius Annual Report 2015, page 3/ Infineon Annual Report 2015, page 4	Compare: Kraft et al, 2013, page 15 and 27 The results show a positive and significant relationship between governance and ROA. Firms with weaker corporate governance are less profitable / Brealey et al, Fundamentals of Corporate Finance, 2015, page 89
RONA – Return on net assets	RONA=Net Income/(fixed Assets+net working capital)	the higher RONA is the better is the proftability of a company's operations. For longer term considerations one time expenses need to taken out of the equation		Compare: Kraft et al, 2013, page 15 and 27 The results show a positive and significant relationship between governance and ROA. Firms with weaker corporate governance are less profitable
ROE – Return on equity	ROE = EBIT / Equity	Measure for profitabilty or return on equity	Adidas AG Annual Report 2015, page 3 - 11,2% / Bayer Annual Report 2015, page 3 / Deutsche Bank, Annual Report 2015, page 48 ROAE post-tax return on average active equity / Commerzbank Annual Report 2015, page 2 - operating return on equity / Daimler Annual Report 2015, page 90 / Deutsche Börse Annual Report 2015, page 54 / Fresenius Annual Report 2015, page 3 /Infineon Annual Report 2015, page 4	Compare: Stiglbauer 2010, page 130 / Brealey et al, Fundamentals of Corporate Finance, 2015, page 90
ROCE – Return on capital employed	ROCE=EBIT/Capital Employed	A higher ROCE indicates more efficient use of total capital. ROCE should be higher than the company's capital cost; otherwise it indicates that the company is not employing its capital effectively and is not generating shareholder value. ROACE is Return on Average Capital Employed.	Linde AG Annual Report 2015, page 3 - ROCE 9,4% / Continental AG page 36, ROCE target of 20%, actual 20,9% / Henkel AG, Annual Report 2015, page 4 / Lufthansa Annual Report 2015, page 2 / EON AG Annual Report 2015, pages 49-50 / BMW AG page 4 / Siemens Annual Report 2015, page 9 / Deutsche Telekom Annual Report pages 11 and 65 / Fresenius Annual Report 2015, page 3 / HeidelbergCement Annual Report 2015, page 81/ Infineon Annual Report 2015, pages 4 and 139 / EON Annual Report 2015 page 50 / Merck Annual report 2015 page 60 / RWE Annual report 20165, page 54 / ThyssenKrupp Annual Report 2015, page 4	Compare: Brealey et al, Fundamentals of Corporate Finance, 2015, page 89
ROI – Return on Investment	ROI=(gain of invest-cost of invest)/cost of invest	Return of total capital invested allows easy comparisons, however does inherently not take time into account, so may need to be adjusted to same time periods for comparison	Volkswagen AG, Annual Report 2015, page 3	Compare: Stiglbauer 2010, page 131
Shareholder Value (SHV)	SHV = Company value/outside capital	A company's discounted projection of future cash flows less the projected total value at the end of the period considered. While somewahlt complicated to calculate it is a very good management approach if not misused to only boost for shortterm effects.		compare: Knaup, 2014, page 22 / Hilbert, Wertorientierte Unternehmensführung, pages 7 ff
Tobin's Q	Q = (MVE + PS + DEBT) / TA**	Future growth potential as seen by capital market Tobin's Q is defined as the ratio of the firm's market value to the replacement cost of its assets plus the book value of the firm's long term debt, and TA is the book value of the firm's total assets		Compare: Stiglbauer 2010, page 131 / Kraft et al, 2013, pages 15 and 24

Source: Own creation.

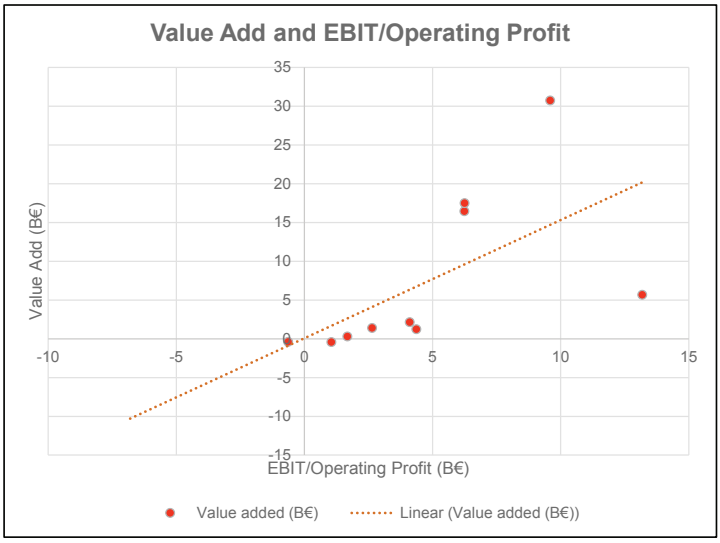
Table 2.: Value add measurements as defined and used by German DAX30 firms

DAX 30 Firms Value Add Measures	calculation	comments	in 2015 annual report
Continental AG Value Contribution (CVC)	CVC=(ROCE - WACC)*average operating assets	CVC - Continental Value Contribution based on ROCE, EBIT, WACC - part of value driver system, to also compare business units	Continental AG, Annual Report 2015, page 50
EACC (Lufthansa AG)	EACC = (Adjusted) EBIT + Interest - Tax - WACC	Earnings after Cost of Capital EACC as well as ROCE replacing CVA (Cash Value Added = Actual Cash Flow - Minimal needed Cash Flow)	Lufthansa Annual Report 2015, page 13
Financial Value Add (Daimler AG)	FVA=NOPAT-(NOA*CC%)/CC FVA=(ROS*NAP-CC%)*NOA	value added is calculated taking cost of capital as the result of net assets and cost of capital expressed as a percentage, which is subtracted from earnings	Daimler AG Annual Report 2015, page 77
MEVA (Merck AG)	MEVA = ROCE - WACC	Merck: ROCE/MEVA as KPIs but no data	Merck Annual report 2015 MEVA page 60
NAV Net Assets Value (Vonavia AG)	NAV=Equity attributable to Vonovia's shareholders + Deferred taxes on investment properties and assetsheld for sale +/- Fair value of derivative financial instruments +/- Deferred taxes on derivative financial instruments	Growth from operating activities and the value of our property assets are two factors that are decisive for the further development of our company and that are reflected in the net asset value (NAV) – a standard parameter in our sector	Vonovia Annual Report 2015 page 105
Thyssenkrupp Value Added (tkVA)	tkVA = EBIT - WACC * CE	tkVA is the value created and permits comparison of the financial performance of businesses with different capital intensity. tkVA is calculated as EBIT minus or plus the cost of capital employed in the business. To obtain the cost of capital, capital employed (CE) is multiplied by the weighted average cost of capital (WACC), which includes equity, debt and the interest rate for pension	Thyssenkrupp Annual Report 2015 page 40
Value Creation (Henkel AG)	EVA	Value creation as corporate approach - Goal of 3x value / footprint by 2030 / taking into account EBIT, ROCE, WACC by BU / EVA as measure	Henkel Annual Report 2015, page 71
Value add (BASF AG)	Value added = Financial Performance - (depreciation & amortization) - (services purchased & energy costs & other expenses) - (cost of raw materials and merchandize)	Financial performance minus goods and services purchased, depreciation and amortization. Business performance includes sales revenues, other operating income and interest income, as well as income from shareholdings.Value add as company strategy reflected in individual employee's goals	BASF Group Annual Report 2015, page 3 / page 31: Value Added = EBIT - WACC, value add as company strategy reflected in individual employee's goals
Value add (Bayer AG)	Value Add = total operating performance - costs of procured goods and services - depreciation and amortization	Bayer: value added is defined as the company's total operating performance in the previous fiscal year less the costs of procured and consumed goods and services, depreciation and amortization. 2015 AR, page 67	Bayer AG 2015 Annual Report, page 67
Value Added (BMW AG)	VA = earnings - (cost of capital rate * capital epmloyed)	the contribution made to business value growth during the financial year is measured in terms of "value added"	BMW AG Annual Report 2015, pages 20-21 and 57
Value Added (EON AG)	Value added = (ROACE – cost of capital) x average capital employed	Value added measures the return that exceeds the cost of capital employed	EON AG Annual Report 2015, pages 2 and 47
Value based management SAP AG		SAP - approach of value-based management as stated on page 63, to target best areas for sustained investments. No specific financial measure mentioned in this section.	SAP AG Annual Report 2015, page 63

Source: Own creation.

The research shows that while 12 out of the 30 corporations claim value add measures or in use only 10 actually do show data. Below graph 1 shows how the absolute value add data from these 10 companies trace over the reported EBIT/Operating Profit number. While there is a huge spread between value add results in average every 10M€ additional EBIT result in 15M€ value add. While this on the first glance may seem as a contradiction in terms, it becomes clearer by looking at the EVA calculation formula with WACC and assets being important factors of the equation.

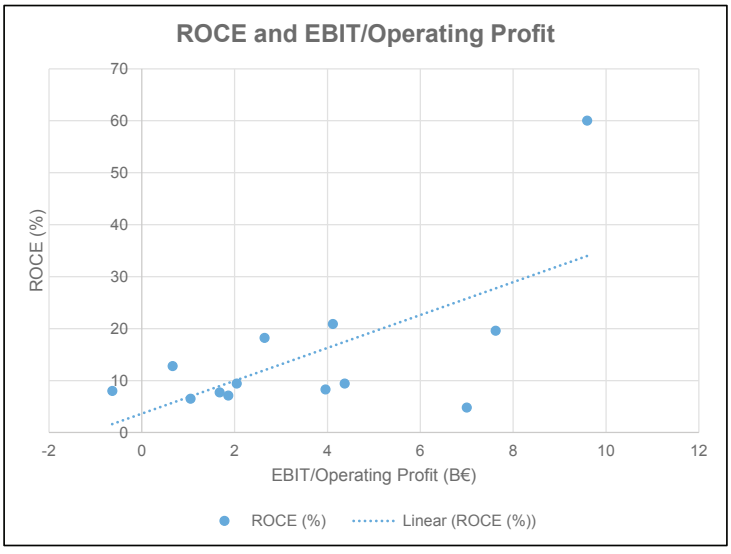
Figure 3.: Value add data tracing over EBIT/Operating profit)



Source: Own creation.

With 43% or 13 out of 30 firms the most used metric is ROCE. Tracing ROCE over EBIT/Operating Profit as shown in below Figure 4., it shows that the spread is way less compared to value add. In average a 1 M€ higher EBIT results in a 3,3% higher ROCE.

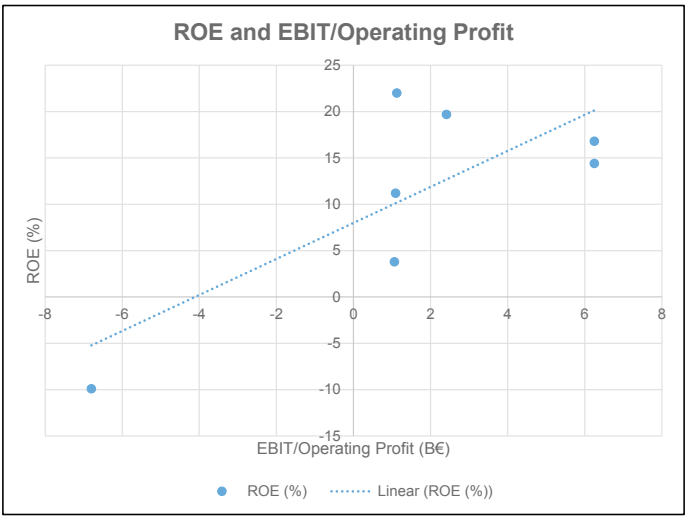
Figure 4.: ROCE data tracing over EBIT/Operating profit



Source: Own creation.

Furthermore 7 out of the 30 firms use ROE as metric. Figure 5. shows also that the highest ROE has been achieved with one of the lowest EBIT values. Obviously this is due to the underlying equity values of the different firms and with a low absolute equity high ROE values are possible as the Figure shows.

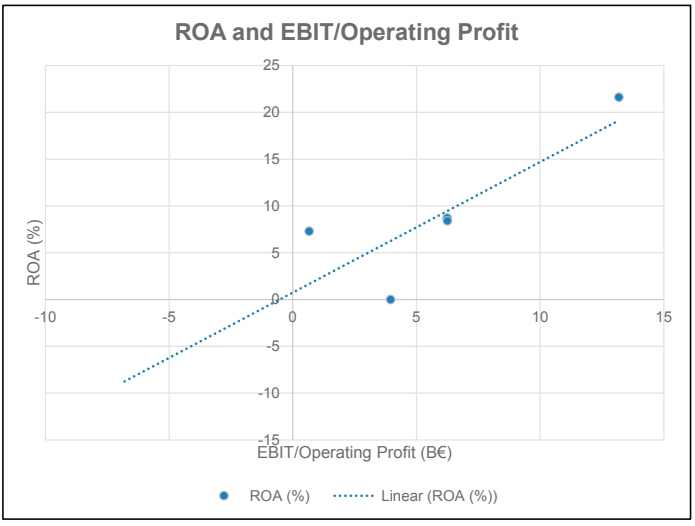
Figure 5.: ROE data tracing over EBIT/Operating profit



Source: Own creation.

To complete the Figure 6. companies are using ROA as value measure. Again plotting ROA over EBIT/Operating Profit in Figure 6. it shows an average increase of 1,5% in ROA for every 1B€ added in EBIT.

Figure 6.: ROA data tracing over EBIT/Operating profit

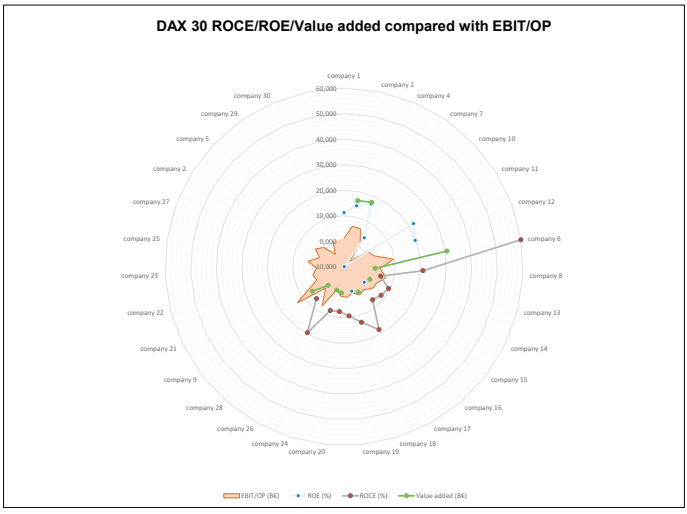


Source: Own creation.

Out of the 30 DAX listed firms 9 are not providing any of the mentioned value add data. That is with 30% an unexpected high share.

This diverged approach to value add measurement is shown in below Figure 7. While EBIT/Operating Profit naturally shows data points for every firm, the other measures don't. Therefore, in below paragraph a correlation analysis is done with the intention to identify those measures best suited for value add representation in absence of a true value add measure.

Figure 7.: Spidergraph showing EBIT/ROCE/ROE/ROA and Value add



Source: Own creation.

3.2. Correlation analyses

In order to identify those measures best suited to represent value add the following correlation analyses were done.

Table 3.: Correlation analyses

Value Add / EBIT correlation		
	Column 1	*Column 2*
Column 1	1	
Column 2	0,6007916	1
Value Add / ROCE correlation		
	Column 1	*Column 2*
Column 1	1	
Column 2	0,9737878	1
Value Add/ ROA correlation		
	Column 1	*Column 2*
Column 1	1	
Column 2	-0,998272	1

Source: Own creation.

A Value Add / ROE correlation has not been performed as there are only two datapoints.

The correlation analysis shows that ROCE obviously correlates best with the Value Add measure and therefore, in case there is no value add data point available ROCE is a very good replacement indicator. No surprise that 13 out of the 30 DAX firms are using and stating ROCE data in their reports.

4. SUMMARY

3 key learnings:

- no consistent approach in terms of using the same metric(s) across 30 DAX corporations with 30% using value add, 43% ROCE, 23% ROE, 13% ROA and 30% none of these.
- ROCE correlates best with the EVA value add measure and is best suited to indicate value add in the absence of an EVA measure.
- Shareholder value is not used.

They increasingly take value add as an managerial approach as part of their aim to professionalize corporate governance.

Value add 33% , ROCE 43%, ROE 23%, ROA 13% , None 30% adding up to more than 100% indicates that several firms report multiple metrics while still a high share of 30% are not reporting any value add metric at all. Two of those are at least referring to a value add approach in their firms yet not providing any data.

Also, very interesting is that Shareholder Value as value metric is not being used any more. Supposedly that is due to the negative touch in the broader population shareholder value still has. However, looking at how its calculated and measured along with including mid-term aspects it really provides a very meaningful set of data if not the most meaningful. (Mauboussin, 2011)

It also became clear that one measure by itself is not a proper judgement. In other words, besides value add, additional metrics must be considered in order to be able to truly judge and rate a firms position. Most of the mentioned measures are periodic measures and can be optimized within the given time period on the expense of longer aspects. Therefore, its strongly recommended even when looking for value creation judgements, besides EVA, ROCE, ROE and ROA to take also in consideration the trends of those over several years and minimally include cash flow, cash position and equity ratio as well as total assets as factors.

5. FUTURE OUTLOOK

The empirical part of this research paper focuses on DAX 30 value add measures in 2015 annual reports. It will be interesting to see how it evolves during 2016 and 2017 which then allows also to see the most actual trends. The future hypothesis is

that we won't see major shifts in the 2016 and 2017 annual reports, however it is expected that value add becomes more and more important beyond the sheer financial measures and metrics. Therefore, value based management approaches, reflected in management guidance, business unit measurements, employee objectives and executive's compensation is what the author believes we will see more going into the next years. This research paper provides the basis for the foreseen future comparisons and trend analyses.

With more data from coming year's reports and from potentially expanding research towards other stock market listed firms the database becomes more significant such that a predictive analytics model can be developed allowing to define best-in-class status.

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EMOTIONAL INTELLIGENCE AND MANAGERIAL EFFECTIVENESS

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ABSTRACT

Purpose. *In this research we have tried to identify the impact of emotional intelligence on the managerial effectiveness.*

Design. *The domains of emotional intelligence identified by the dr. Daniel goleman namely self-awareness, self-regulation, social skill & empathy have been tested to include in the listing of 16 managerial skills namely confidence in subordinates, communication and task assignment, networking, colleagues management, discipline, informal communication, management of market environment, conflict resolution, integrity and communication, client management & competence, motivating, delegation, image building, welfare management, consultative, & inspection and innovation - the scale developed by seeta gupta in 1996. Statistical package for the social science is used for analysis. Descriptive analysis is used to define the key aspects and sample formation. Two tailed pearson correlation was applied to check and test the relationship among the variables used in the research. Regression analysis was used to identify the significance, magnitude and direction of the variables*

Findings and implications. *We have concluded that all four traits of emotional intelligence have been found significant, therefore suggested to include them in the scale of managerial effectiveness.*

1. INTRODUCTION

A popular proverb *"People leave managers, not organization"* indicates that handling people is always a difficult task from a long time. With the increasing demand of luxurious life and fast pace of technology growth, people are more educated and want to be dealt and handled with nice and polite way. This approach has also created a bottleneck situation for the mangers and leaders to lead their staff and teams with the hawk-eye for accomplishing of the assignments and dealing with the people with more sophisticated manner keep them motivated and retain the talent.

The impact of globalization has increased the competition in the business environment. The organizations require a team of managers to run the day to day operations. Identifying the team's abilities and capacity, build them into synergy, and become the consistently high-performing team is the need of today's business world. Today, in 21st century, the business organizations have been transformed into a complex structured with vigorous and increasingly erratic employees and customers. This has enforced the managers to think seriously for handling and dealing with such organisms and to convert the conventional structure with lively, mutually supporting, interactive and creative environment. To gain and maintain the competitive advantage in the market and industry, organizations need to prepare their employees to adapt and adjust in the changing environments, both externally and internally (Prati, Douglas, Ferris, Ammeter, & Buckley, 2003).

Although, the literature has significant evidences that have linked the emotional intelligence with the trait of leadership effectiveness, but very little material have been found which directly deals with the managerial effectiveness. The researchers have linked and tested the relationship between emotional intelligence and transformational leadership style, (Barling, Slater, & Kelloway, 2000; Gardner & Stough, 2002; Sivanathan & Fekken, 2002) . *'Transformational leaders'* are said as those managers / executives who creates a vision, transform this vision into mission, build promising approach and attitude among subordinates towards the vision and create a challenging environment within the workplace. On the other hand, *'transactional leaders'* are considered as typical managers who wish to and maintain the conventional state of ordering, commanding and power. They are more work concentrated and focus the traditional management practices by getting the work done on time and within the resources. Such managers usually keep the track of regular and ongoing activities and tasks and keep relating the job performance with incentives and rewards.

It is observed and believed that transformational leaders are more capable to take-up and handle the strategic matters of the organization and are able to develop commitment in employees in long run, such leaders are considered and are more likely to provide a broader vision and take an organization forward (Rosete & Ciarrochi, 2005).

1.1. Emotions

"Emotion" is the generic term used in the field of psychology, philosophy, and their many subsets, for subjective that refers to the "conscious experience". It describes the psycho-physiological expressions, biological reactions, and mental states in a human being.. Emotions are not limited to human beings only, they are also produced in other beings and creatures such as animal and birds (Mayer & Salovey, 1997).

1.2. Intelligence

David Wechsler, who is well known due to his invention in developing the intelligence test scales , he has concluded that **total** intelligence cannot be measured until psychological tests are included to measures some of the "non-intellective factors." During the same era an Ohio State's investigation stated that leaders who can, and are good in establishing and maintaining mutual trust, respect, warmth and rapport in their teams are prove to be more effective than those who were merely brilliant, but cold and calculating strategists.

Intelligence is the function of cognitive part of human mind that pertains the abilities of the, "power to combine and separate", "concepts to judge and to reasons", and to "engage in abstract thought" (Mayer & Salovey, 1997).

Intelligence = f (cognitive sphere of mind)

1.3. Emotional intelligence

Emotional Intelligence (EI) is defined, and is considered, as a capability of an individual to recognize and identify emotions, create and retrieve emotions and so help in attaining the state of contemplation (Mayer & Salovey, 1997).

Goleman (1995) defines Emotional Intelligence as an aptitude of an individual to be familiar with his or her own feelings in term of emotions, strengths, weaknesses, needs,goals, drives and values, and to sought the same in others people working around him /her, to keep them motivated and maintaining healthier relationships with them. Thus, Emotional Intelligence is an assortment of non-cognitive capabilities, competencies, and skills that empower the individual to succeed in handling and deal with the environmental demands and pressures. IQ is not the final or even the most important predictor of successful job performance.

1.4. Managerial effectiveness

Stephen R. Covey defines effectiveness as those activities of an individual that incur the positive changes in tasks and relationships that benefit him /her in a long-

term for the better results. Such activities form the habits of an individual that reflects the person's character. These habits enables the individual to perform effectively and consistently to solve the problems, to become an opportunist, work and learn continuously and gain the ladder of growth (Covey, 1989).

In modern era although the term or the factor of *'Managerial Effectiveness'* has been molded into the 'Leadership Effectiveness' however, the previous researches have significant evidences that support the area of "Managerial Effectiveness" for the accomplishment of the better job done through staff and subordinates . The study on the factors of managerial effectiveness varies widely from organization to organization and from job to job and hence the criteria of effectiveness needs to be carefully and objectively defined (Sy, Tram, & O'Hara, 2006). Mintzberg (1973) suggested that managers' jobs are remarkably similar and that the work of all managers can be usually described by common set of behaviors or roles. He stated that all managerial jobs can be defined in terms of ten roles: interpersonal (three), informational (three) and decisional (four). According to this approach, managers are effective in different ways at different times depending on the combination of different roles at each level.

Therefore, either it remains the word "Leadership" or "Managerial" the way to handle the "people" and "tasks" is the main focus for this research through the characteristic of "Emotional Intelligence". Therefore, this research has not been restricted to any specific sector, rather it has been diversified on the overall traits indentified for the managerial position in the organizations.

Gladson Nwokah and Augustine I. Ahiauzu (Nwokah & Ahiauzu, 2009) tested the Goleman's (2001) four domains of emotional intelligence namely *Self -awareness*, *Self - management (Self-regulation)*, *Social -awareness (Empathy)* and *Relationship Management (Social skill)* as predictor variables, the same has been adopted in this research to see the impact on the scale of managerial effectiveness developed by Seeta Gupta in her research Managerial Effectiveness (Gupta, Jan 1996).

2. LITERATURE REVIEW

2.1. Brief history of Emotional intelligence

In 1920 almost 90 years back, Thorndike (Thorndike, 1920) proposed the construct of social intelligence, he presented the theory of intelligence in which he organized the intelligence under 3 dimensions i.e. "mechanical intelligence", "abstract intelligence", and "social intelligence". The mechanical intelligence of an individual is the level of the ability and capacity to manage things and processes. The ability of an individual to manage and understand the ideas and symbols is categorized under the abstract intelligence; whereas the social intelligence refers to understanding and managing the people i.e. interpersonal situations.

Thorndike's (Thorndike, 1920) classification of intelligence prompted and provided a roadmap for the expansion in the field of intelligence framework. However major emphasis was remained in the area and fields of mechanical and abstract intelligence during that era. Although some psychologists worked on the measurements and development of social intelligence and tried to explore the spectrum of the field but were remained under the criticism. Thorndike, himself (Thorndike & Stein, 1937) expressed his doubt on the verbally derived instrument could measure social intelligence.

In 1983 Gardner presented the theory of multiple intelligences in which he explore the 2 dimensions of intelligence i.e. "interpersonal" and "intrapersonal" intelligence. The interpersonal theory deals with the philosophy of understanding other people; whereas, intrapersonal deals with understanding oneself.

Cantor and Kihlstrom in 1989 argued and suggested that social intelligence plays the major role in developing the cognitive aspects of personality in an individual. Schneider, Ackerman, and Kanfer in 1996 further elaborated the perspective and suggested that social intelligence directs and builds the social competence.

In 1997 Mayer and Salovey presented and published their analysis on the theories of social intelligence and supported the arguments of Schneider and others on the social intelligence as a global construct. Along with this, they presented the concept that, the group of abilities in an individual is different from the traditional dimensions of intelligence and are covered under the umbrella of 'Emotional Intelligence'. The conceptual framework of emotional abilities given by them consisted of 4 levels hierarchy which includes the ability to perceive, appraise, and express emotion, an ability to use emotions to facilitate cognition, the ability to understand and analyze emotions, and the ability to regulate emotions to facilitate emotional and cognitive growth (Mayer & Salovey, 1997).

2.2. Emotional intelligence domains

Emotional intelligence has relatively a young age as a variable of interest in organizational research. Researchers have examined the impact of emotional intelligence on transformational leadership, the attributes of leaders, and leadership in self-managing teams. (Jordan & Troth, 2011)

2.3. Transformational leaders

Transformational leaders are called to be managers /executives that focuses to create a vision, build the intellectual stimulation, encourage, advocates and promote the productive and new ideas of staff, inspire motivation, trasmits optimism, build commitment amongst subordinates and provides the sence of direction within the workplace (Mandell & Pherwani, 2003; Rosete & Ciarrochi, 2005). The key characteristic of Transformational

Leader is the focus on "Learning & Knowing". The theory on transformational leadership is based on 4 characteristics:

- Inspirational Motivation
- Intellectual Stimulation
- Idealized Influence
- Individualized Consideration

2.4. Transactional leaders

Transactional leaders are seems to be like conventional managers who expects more productivity form individual in return to give rewards. Their center of attention remains in providing the necessary resources to the employees needed to accomplish their job timely and linking their job performance to rewards.

Transactional Leaders are more focused towards tasks completion rather than individual interests and get the work done within the available resources. These leaders are change resistant and work under the defined rules, discouraging the innovation. They use predetermine criteria to monitor performance and believe in making all the decisions by themselves and expecting employees to simply follow the rules and instructions (Rosete & Ciarrochi, 2005)

Transformational leaders are believed to be more diversified executives who are able to deal with strategic matters more efficiently and can build commitment in employees. Organizations are more likely to move forward and upward under the leadership of these executives. (Rosete & Ciarrochi, 2005). The literature of Emotional Intelligence have been focused in perspective of transformational leadership and argued its contribution to effective leadership. (Jordan & Troth, 2011).

Literature has provided the evidence that Emotional Intelligence has been referred to the traits of a human which includes 'motivation', 'empathy', 'sociability', 'warmth', and 'optimism' (Rosete & Ciarrochi, 2005). Rosete and others have sorted out the EI approaches into 2 broad categories:

(1) Ability models and

(2) Mixed models.

Ability models describes and explains the Emotional Intelligence in the perspective of cognitive intelligence as depicted by Mayer and Salovey (i.e. intelligent quotient (IQ). On the other hand, mixed models of Emotional Intelligence assimilate both non-cognitive models as of Bar-On, 1997 and competency-based models as by Goleman, 1995 (Rosete & Ciarrochi, 2005).

It has been reviewed form last 6 decades researches that researchers have used the the emotional construct to check and state the relationship between 'positive moods' and 'charismatic leadership', 'emotional management' and 'transformational leadership', 'emotional expression' and 'leader member exchange', 'leader's

emotional displays' and 'followership behavior' etc . (Jordan & Troth, 2011; John D. Mayer, Salovey, & Caruso, 2004)

The paradigm of emotional intelligence given by Mayer and Salovey (1997) indicates 4 inter-related emotion processing abilities: (i) 'the perception', (ii) 'assimilation', (iii) 'understanding own and others emotions' and (iv) 'management of own and others emotions'.

In 2005 Ashkanasy and Daus provided the framework on EI based on 3 pillars whose foundations were linked with the Mayer and Salovey (1997) model of emotional intelligence. They materialized the emotional intelligence as a skill that should be measured as conventional intelligence tests with an "ability test". Other researchers agree with the idea and construct of Mayer and Salovey (1997), but argue that this ability can be measured through a "self report test". Finally, some researchers define emotional intelligence as a type of 'personality variable' (Jordan & Troth, 2011).

Jordan et al. (2002) have examined and commented about the practical abilities of the emotional intelligent employees that they use and show in the workplace. According to them effective employees need to be aware and manage of their own emotions and the emotions of others in the workplace. Jordan and Lawrence (2009) while their business focused research, adopted a four dimension definition of individual emotional intelligence that replicate the generally accepted Mayer and Salovey (1997) model of emotional intelligence. This model comprises 4 constructs:

(1) 'Awareness of own emotion';

(2) 'Management of own emotion';

(3) 'Awareness of others emotion'; and

(4) 'Management of others emotion'.

Deniel Goleman reviewed his original model of emotional intelligence developed in 1995 in 1998. He sorted 25 social and emotional competencies that are most strongly predictor of superior performance in many occupations. Goleman organized these competencies into the five dimensions namely "self-awareness", "self-regulation", "self-motivation", "social awareness", and "social skills".

Goleman (1995) defines, emotional intelligence "is the capacity for recognizing our own feelings and those of others, for motivating ourselves, and for managing emotions well in ourselves and in our relationships." After the emergence of this periodical, many other researchers, writers and HR specialists have contributed enormously on the topic of Emotional Intelligence. Many definitions of Emotional Intelligence came into existance such as: "The ability to perceive and express emotion, assimilate emotion in thought, understand and reason with emotion, and regulate emotion in the self and others" (J. D Mayer, Salovey, & Caruso, 2000). Cherniss and Adlet (G. Cherniss & Adlet, 2000) have defined "emotional intelligence" as: "the ability to accurately identify and understand one's own emotional exactions and

those of others." It has also been indicated by some authors, that emotional intelligence "also involves the ability to regulate one's emotions, to use them to make good decisions and to act effectively." They emphasized that emotional intelligence is the foundation for personal traits and characteristics such as knowledge of personal strengths and weaknesses, realistic self-confidence, personal integrity, self-motivation, resilience in times of change or adversity, perseverance, and the skill for getting along well with others.

2.5. Managerial effectiveness

An organization needs effective and skilled executives to facilitate corporate success in the long run. Effectiveness of executives plays a vital role for the success of an organization in the contemporary business dome. Organizations need competent and SMART working managers to be able to achieve their objectives efficiently and effectively. The executives are employed for their skills and expertise to maximize the profitability of the organization. They induce a vital role in developing and executing of organization operations and create an affective function for the implementation of strategies and policies (Yang, Zhang, & Tsui, 2010). In this context, "managerial effectiveness" is an important factor that enables effectual operations and delivery of complex initiatives (Bamel, Rangnekar, & Rastogi, 2011).

According to Drucker (1967) managers are vital and the life giving elements in every business, and without them the resources cannot be converted into high production. A key function of managers is to determine what has to be done and how it is to be done.

Aggregation of employees' performance represents the organizational performance which places stress on the efficient use of resources and accomplishment of desirable outcomes. With increased dependency of business on information technology, managers are required to sort out new ways to facilitate organizational production and sustainable self-growth. The role is continually changing and becoming challenging with the increasing organizational complicated structures, globalization, the accelerated product life cycle, growing complexity of relationship with stakeholders, scarcity of the resources, and intense competition. Indeed, there has been the debate over how to assess executive managerial effectiveness, which provides a pathway for utilizing resources efficiently (Bamel, et al., 2011).

An effective manager is the one who knows and is aware from all kinds of behavior and actions which directs and lead towards organizational results and who then chooses to engage in those apposite to the environment, the particular managerial job, the situation, and his own personal preferences. Mintzberg (1973) suggested that manager's jobs are similar and the work done by the managers regardless of any industry can be described by the common set of behaviors and roles. He defined the manager's job in terms of ten roles: interpersonal (three), informational (three) and

decisional (four). According to this approach, managers are effective in different ways at different times depending on the combination of different roles at each level.

Balaraman (1989) defined managerial effectiveness in behavioral terms which evaluated managers on selected job oriented criteria such as communication, cost awareness, delegation of work, labor relation, planning and scheduling, securing interdepartmental cooperation, training subordinates and utilization of capacity. Das (Das, 1987) recognized the distinctiveness of competent and capable branch managers as - setting an example by personal qualities and characteristics, grip on job knowledge and business intelligence and human-management ability. Misumi and Peterson in 1985 (J. Misumi & Peterson, 1985; Jyuji Misumi, 1989) and 1989 defined the ideal manager in Japan as the *one who leads the group towards goal accomplishment and safeguard its social stability in terms of both performance and maintenance.*

According to Nwachuku (1989), an appropriate skill mix appears necessary in order to meet the instability in organizational demand. At lower levels of management (entry levels) technical skill is most important; at middle management level process skills (directing, coordinating, planning and controlling) are most essential; and at senior level conceptual skill is most relevant.

The model of managerial Effectiveness proposed by Campbell and others in 1970 covered the three main areas of an organization as a component of the model i.e. *Person-Process-Product*. The *'Person'* in the model refers to the individual /manager's characteristics traits and abilities, *'Process'* is the managers on the job activities and behavior, while *'Product'* refers to the organizational results such as profit maximization and productivity. (Morse & Wagner, 1978)

Morse and Wagner (Morse & Wagner, 1978) developed an instrument to evaluate the performance and activities that account for similarities and differences among manager's jobs. They worked out the 6 factors instrument for an effective manager, i.e.

Factor I: *Managing the Organization's environment and its resources*

Factor II: *Organizing and coordination*

Factor III: *Information handling*

Factor IV: *Providing for growth and development*

Factor V: *Motivating and conflict handling*

Factor VI: *Strategic problem solving*

According to Morse and Wagner the work of all managers may be usefully described by the behavior and activities incorporated in the instrument, but it may be expected that different managers in different managerial jobs will place more or less attention on specific behavior associated with particular roles to perform effectively. For example, top-level and middle-level managers might probably be more

concerned with the activities associated with "controlling the organization's environment and its resources" than low-level managers. Similarly, many managerial position requires working through and with people in the organization, and might have to attend to "motivating and conflict handling" activities. Concerning specific situational variables, managers facing a temporary crisis may give extra attention to activities involving "strategic problem solving" and less attention to activities involving, say, "providing for growth and development" until the crisis is resolved. (Morse & Wagner, 1978; Page, Wilson, & Meyer, 1999).

Thus, if the managers are to be effective, they categorized with the roles they engage in within the contingencies of the situation. Finally, it must be recognized that the manager himself is an important variable to consider in this approach to managerial effectiveness. Based on differences in personality predispositions, managerial style, skills, and abilities, managers may choose to emphasize particular roles and pay less attention to others. (Morse & Wagner, 1978)

In 1996 Seeta Gupta developed the scale for Managerial Effectiveness in which she identified 19 dimensions from a literature review of behaviors and characteristics of the managers in India, which were further reduced to following sixteen.

F-I: Confidence in subordinates	F-IX: Integrity and Communication
F-II: Communication and task assignment	F-X: Client Management & Competence
F-III: Networking	F-XI: Motivating
F-IV: Colleagues management	F-XII: Delegation
F-V: Discipline	F-XIII: Image building
F-VI: Informal communication	F-XIV: Welfare management
F-VII: Management of market environment	F-XV: Consultative
F-VIII: Conflict Resolution	F-XVI: Innovation and inspiration

The scale appeared to be a useful instrument for appraising and evaluating the effectiveness of managers who were in managerial roles. Conceptually, the scale's items supported the definition of managerial effectiveness as the *"Ability of a manager to carry out the activities required of his position while achieving the results both current and in terms of developing further potential"*. (Gupta, Jan 1996)

2.6. Self-Awareness

It is the capability of an individual to identify or recognize a feeling as it occurs. It describes the aptitude of a person who has an accurate understanding of his /her strengths and weaknesses. Being fully aware of what one feels in a moment and using that feeling guide him /herself to behave or respond. Self-Awareness is associated

with the individual competencies as "emotional self-awareness", "accurate self-assessment" and "self-confidence" (Nwokah & Ahiauzu, 2009).

The feature of self-awareness is associated with internal desire and anxiety control. If one get angry and get anxious easily, it is possible that others may infer this as a lack of self-awareness and may draw conclusions about as how he /she handle and behave in difficult and challenging circumstances. If one does not understand his /her own feelings, he /she won't be good at controlling others - or reading other people.

The skills and the features of a self-aware person are:

(a) Be willing to examine how one makes his/her own evaluations.

(b) Recognize negative thinking, anger and mood swings.

(c) Practice tuning into own senses (all 5)

(d) Make an effort to learn one's own intentions.

(e) Pay attention to own behaviors

2.7. Self-Management

Self-Management or Self-Regulation is the capability to control or regulate the feelings /emotions to keep them in balance - especially negatives ones. It is the capacity of a person to keep in touch what he /she feels and keep the balance between the good and bad feeling. It is the learning to be a balanced in daily life. Gardner (1983) suggested the Self-Awareness & Self-Management domains of EI as "Intrapersonal Intelligence" (Nwokah & Ahiauzu, 2009).

If someone is not good in self-management trait and is unable to control the feelings as it occurs, it is possible that he /she may get controlled by the feelings - particularly powerful and intensive ones like anger, frustration or panic (Nwokah & Ahiauzu, 2009).

The skills, competencies and the features that are required to be Self-Managed includes:

(a) Learn how to use self-talk as a tool and a skill

(b) Avoid negative thinking.

(c) Learn relaxation skills

(d) Develop and use a sense of humor

(e) Self-Control

(f) Transparency

(g) Adaptability

(h) Achievement

(i) Initiative

(j) Optimism

2.8. Social Awareness

Social awareness or Empathy is counted towards the most influential and compelling of emotionally intelligent management practices. It the aptitude to know and read how others are feeling, have the approach according to their viewpoint - without letting yourself to be controlled by someone else's feelings. It is being able to feel as others feel. Over two decades ago, Rosenthal (1977) and his colleagues at Harvard acclaimed that people who are most excellent in recognizing others emotions are more successful in their work as well as in their social lives (Cherniss, 2000).

The skills desired for being Socially Aware includes:

(a) Learn to use sensitivity

(b) Become aware of own defenses

(c) Take time to tune into the emotional background of own environment.

(d) Practice matching communication with others:

  (i) Demonstration with a student volunteer re: empathic responses.

  (ii) Discussion of demonstration.

2.9. Relationship Management

It is the learning to interact in a healthy manner with others. Developing long lasting, positive relationships and using the other Emotional Intelligence dimensions to influence, lead, negotiate, collaborate and network. Gardner (1983) suggested the Social-Awareness & Relationship Management domains of Emotional Intelligence as "Inter-personal

Intelligence" (Nwokah & Ahiauzu, 2009).

(a) Pay attention to the details of own relationships.

(b) Maintain own emotional perspective.

(c) Anticipate own moods in situations that will be encountered.

(d) Learn to be an active listener.

3. RESEARCH METHODOLOGY

3.1. Introduction

This research involves the quantitative research methodology and was conducted to analyze the influence of Emotional Intelligence on Managerial Effectiveness through questionnaire adopted from two difference researches.

3.2. Research questions

This research was envisioned to know the answers of following questions:-

- Does Self-awareness improve the efficiency of a Manager?
- Does Self-management contribute positively to the effectiveness of a Manager?
- Is Social awareness is necessary for Managerial Effectiveness?
- Does Relationship management have any impact on Managerial Effectiveness?
- Do Emotional Intelligence can be included in Managerial Effectiveness Scale?

3.3. Research variables and hypothesis: Independent variables

3.3.1. Self-Awareness (SeA)

"Self-Awareness" is the trait of Emotional Intelligence which briefs about the person knowledge about him /herself. It is the ability to identify or recognize a feeling as it occurs. It describes the aptitude of a person who has an accurate understanding of his /her strengths and weaknesses. It has been used in this research as an independent variable to see the relationship on the dependent variable i.e. Managerial Effectiveness.

It will provide that if the results are positive it will indicate that it is needed in a manager for handling people and tasks effectively.

So, the Hypothesis developed is:-

H1: Self-awareness leads to Managerial Effectiveness

Equation: ME = A + B(SeA)

3.3.2. Self-Management (SeM)

Self-Management is the ability to control or regulate the feelings /emotions to keep them in balance - especially negatives ones. It is the capacity of a person to keep in touch what he /she feels and keep the balance between the good and bad feeling. It is the learning to be a balanced in daily life. In this research it is used as independent

variable to see the relationship on the dependent variable i.e. Managerial Effectiveness.

It will prove that if the results are positive it will indicate that it is needed in a manager for handling people and tasks effectively.

So, the Hypothesis developed is:-

H2:Self-management contributes positively to Managerial Effectiveness

Equation: ME = A + B(SeM)

3.3.3. Social-Awareness (SoA)

Social Awareness is the capability to know and interpret how others are feeling, taking, their perspective into substance and relate to others - without allowing yourself to be hijacked by someone else's feelings. It is being able to feel as others feel. In this research it is used as independent variable to see the relationship on the dependent variable i.e. Managerial Effectiveness.

If the results are positive it will indicate that it is needed in a manager for handling people and tasks effectively.

So, the Hypothesis developed is:-

H3:Social awareness has a positive influence on Managerial Effectiveness

Equation: ME = A + B(SoA)

3.3.4. Relationship Management (ReM)

Relationship Management is also a characteristic of Emotional Intelligence. It is the learning to interact in a healthy manner with others. Building enduring, positive relationships and using the other Emotional Intelligence dimensions to persuade, lead, negotiate, collaborate and network (Ghiabi & Besharat, 2011). In this research it is used as independent variable to see the relationship over the dependent variable i.e. Managerial Effectiveness.

If the results are positive it will indicate that it is needed in a manager for handling people and tasks effectively.

So, the Hypothesis developed is:-

H4: Relationship management leads to Managerial Effectiveness

Equation: ME = A + B(ReM)

3.4. Dependent variable

3.4.1. Managerial Effectiveness (ME)

Managerial Effectiveness can be defined as a process of change due to influence and actions of a manager in the hole process of the business operations which directs

and leads towards improved organizational results and who then chooses to engage in those opposite to the environment. In this research it is used as dependent variable to see the relationship with 4 domains of Emotional Intelligence

If the results are positive it will indicate that Emotional Intelligence is necessary for handling people and tasks effectively.

So, the Hypothesis developed is:-

H5: Emotional Intelligence is considered as a scale of Managerial Effectiveness

Equation: ME = A + B(EI)

3.4.2. Research type & data collection tool /questionnaire

A survey research was carried out to collect the primary data and test our conceptual model from 357 respondents working at some managerial/ supervisory level in service industry. The tested questionnaire of Likert sacle from 1 to 5 was adopted form previously held researches on the variables used in this research. The Part-I of the questionnaire contains the 45 questions related to *'managerial effectiveness'* adopted form the research of Seeta Gupta an Indian author from her research "Managerial Effectiveness: Conceptual Framework and Scale Development" (Gupta, Jan 1996). Part-II of the questionnaire contains 20 questions in context to *'Emotional Intelligence'* was adopted form the research of Gladson, Nwokah, & Ahiauzu, titled "Emotional intelligence and marketing effectiveness" (Nwokah & Ahiauzu, 2009)

3.5. Population

The target population of the current study was the employees of service industry working at supervisory or managerial position. Population comprised of elements using corporate sectors of Rawalpindi /Islamabad, Lahore & Karachi. The corporate companies included in this research were Ufone, Warid, Mobilink, Telenor, Faysal Bank Limited (FBL), Habib Bank Limited (HBL), United Bank Limited (UBL), Allied Bank Limited (ABL), Bank Alfalah Limited (BAF), Standard Chartered Bank (SCB). The estimated population of managers in these organizations was calculated to near about 5000.

3.6. Sample

Random sample of 357 managers was selected as per the Table 1. of Uma Sekaran Book page 295 (Sekaran & Bougie, 1984) from the managers working in 10 selected organizations for the estimated population of 5000.

The questionnaires were floated as per bifurcation presented in Table 1..

Table 1.: Random sample

Organization	Qty distributed	Qty returned
Faysal Bank Limited (ISB, RWP, LHR, KHI)	80	55
Allied Bank Limited(ISB, RWP, LHR)	50	36
Habib Bank Limited (ISB, RWP)	40	18
Standard Chartered Bank (RWP, ISB)	40	10
United Bank Limited (RWP, ISB, LHR)	40	28
Bank Alfalah Limited (RWP, ISB, LHR, KHI)	40	13
Telenor	20	3
Ufone	20	8
Warid Tel	20	5
Mobilink	20	2
Others	30	13
Total	400	191

Source: Authors.

3.7. Data analysis technique

Once the data was collected statistical tools and techniques were required to analyze and examine information, as this is quantitative in nature.

SPSS v.16.0 for Windows was used to apply the related statistical tools. Two tailed Pearson correlation was applied to check and test the relationship among the variables used in the research. Correlation analysis helped in determining the degree and form of relationship between Self-Awareness (SeA), Self-Management (SeM), Social-Awareness (SoA) & Relationship Management (ReM) with dependent variable Managerial Effectiveness (ME).

Regression analysis was used to identify the significance of Self-Awareness (SeA) & Managerial Effectiveness (ME), Self-Management (SeM) & Managerial Effectiveness (ME), Social-Awareness (SoA) & Managerial Effectiveness (ME) , Relationship Management (ReM) & Managerial Effectiveness (ME) and over all SeA + SoA + SeM + ReM & ME.

4. RESULTS

4.1. Descriptive analysis

For the estimated population for this research the sample was drawn to 357. However, 400 questionnaires were floated to supervisory/ manager level staff of 10 companies in the area of Islamabad, Rawalpindi, Lahore & Karachi, but total of 191

was returned. The overall response rate in this research remained to 53.5%. The reason for such low response rate was the difficulty of the questionnaire as it was adopted from previously held researches and secondly the busy and hectic office time routine of the respondents as it was to be collected for supervisory level staff of banks and mobile operators company. Maximum of the respondents were given the personal assistance through self-administered and acquaintance's assistance. Response from male respondents was 66.5% and female was 33.5%.

The maximum respondents were found from the age group of, 30-35 & 36-40 which were 73.30% of the total respondents. Therefore the results of our demographic characteristics were not normally distributed. It can be controlled if some more time is given to the respondents and continuous follow-up is kept.

4.2. Reliability analysis

Reliability analysis through Cronbach Alpha was conducted to test and determine the inter correlations among the items of the variables of our study.

The reliability analysis for the complete model of 65 items is 0.914, which shows that the framework of our study is significantly reliable which can be used to apply further statistical tests to generate generalize results.

Table 2.: Reliability analysis of complete model

Cronbach's Alpha	N
.914 Table 2(a) Reliability Analysis of Managerial Effectiveness	65
.903 Table 2(b)	45
Reliability analysis of Emotional Intelligence .711	20

Source: Authors.

4.3. Descriptive analysis

Following table shows the values of descriptive statistics with skewness and kurtosis for N=191. Skewness is the numerical measure of shape that tells the amount and direction of skew (departure from horizontal symmetry), whereas Kurtosis tells how tall and sharp the central peak is, relative to a standard bell curve.

Table 3.: Descriptive statistics

	Min.	Max.	Mean	Std. deviation	Skewness	
					Stat	Std. error
Managerial Effectiveness	1.7778	4.7111	3.7996	.4376	-.435	.176
Self - Awareness	1.4000	5.0000	3.8816	.4439	-.136	.176
Self-Management	2.0000	4.8333	3.6849	.4852	-.437	.176
Social - Awareness	2.0000	5.0000	4.0392	.4958	-.772	.176
Relationship Management	1.8000	5.0000	3.8324	.4794	-.877	.176

Source: Authors.

Bulmer, M. G., Principles of Statistics (Dover, 1979)— suggests this rule of thumb: "

- If skewness is less than -1 or greater than +1, the distribution is **highly skewed**.
- If skewness is between -1 and -½ or between +½ and +1, the distribution is **moderately skewed**.
- If skewness is between -½ and +½, the distribution is **approximately symmetric**."

Therefore, for this research the skewness of *Managerial Effectiveness* (-0.435) lies in the category of *approximately symmetric*, skewness of *Self-Awareness* (-1.136) lies in *highly skewed*, skewness of Self-Management (-0.437) lies in *approximately symmetric*, skewness of Social-Awareness (-0.772) *moderately skewed* and skewness of *Relationship Management* (-0.877) lies in *moderately skewed.* Since all the variables are negatively skewed which indicate that the left tail is longer for all the variables.

When the distribution is symmetric, we need to analyze the central peak for its height and sharpness; this analysis is measured by a number called Kurtosis. Higher values indicate the higher and sharper peak, lower values indicate less distinct peak. Higher kurtosis means more of the variability is due to a few extreme differences from the mean, rather than a lot of modest differences from the mean. The values of Kurtosis for different distributions are as follows:

- "A normal distribution has kurtosis exactly 3 (excess kurtosis exactly 0). Any distribution with kurtosis ≅3 (excess ≅0) is called **mesokurtic**.
- A distribution with kurtosis <3 (excess kurtosis <0) is called **platykurtic**. Compared to a normal distribution, its central peak is lower and broader, and its tails are shorter and thinner.
- A distribution with kurtosis >3 (excess kurtosis >0) is called **leptokurtic**. Compared to a normal distribution, its central peak is higher and sharper, and its tails are longer and fatter.

The smallest possible kurtosis is 1 (excess kurtosis -2), and the largest is infinity (∞)."

4.4. Factor analysis

Factor analysis is used to determine the characteristics and the behavior of the items /questions asked in the questionnaire whether they relate or not to the construct that is intended to be measured. Since the questionnaire adopted in our research was from multiple resources that's why we have applied exploratory factor analysis on our data. The results indicate that there is no problem of multi-collinearity and singularity in our data.

The KMO and Bartlett's test values lies between 0 and 1, which shows the Sampling Adequacy. In our data the value of Sampling Adequacy measures to 0.754 which is significant. Therefore factor analysis is appropriate for this data.

Table 4.: KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.754
Bartlett's test of sphericity	Approx. Chi-Square	1.065
	Df	2080
	Sig.	.000

Source: Authors.

4.5. Correlation analysis

Correlation analysis was carried out using Pearson correlations among all the variables. Pearson correlation indicates the relationship between two variables which could be either positive or negative i.e either in same direction or opposite direction (Jawad et al., 2018).

Since the Pearson Correlation of Managerial Effectiveness (ME) with Self-Awareness (SeA), Self-Management (SeM), Social-Awareness (SoA) & Relationship Management (ReM) for N=191 is 0.555, 0.542, 0.292 & 0.357 respectively which indicates that all Independent Variables have positive relationship /correlation with the dependent variable i.e. changes in SeA, SeM, SoA or ReM will bring change in ME in the same direction i.e. positive.

The Sig. (2_tailed) value of all correlation is 0.000 < 0.05 it is concluded that the correlation between SeA, SeM, SoA, ReM & ME is statistically significant.

Table 5.: Correlation analysis

		ME	SeA	SeM	SoA	ReM	EI
Managerial Effectiveness (ME)	Pearson correlation	1					
	Sig. (2-tailed)						
Self Awareness (SeA)	Pearson correlation	.555**	1				
	Sig. (2-tailed)	.000					
Self Management (SeM)	Pearson correlation	.542**	.541**	1			
	Sig. (2-tailed)	.000	.000				
Social Awareness (SoA)	Pearson correlation	.292**	.276**	.263**	1		
	Sig. (2-tailed)	.000	.000	.000			
Relationship Management (ReM)	Pearson correlation	.357**	.382**	.170*	.271**	1	
	Sig. (2-tailed)	.000	.000	.019	.000		
Emotional Intelligence (EI)	Pearson correlation	.622**	.774**	.707**	.660**	.653**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	

Source: Authors.
***. Correlation is significant at the 0.01 level (2-tailed).*
**. Correlation is significant at the 0.05 level (2-tailed).*

4.6. Regression analysis

Regression Analysis is used to calculate and test the power of independent variable upon which it explains the dependent variable. In this research simple linear regression is used to test the hypothesis, because we needed to check the impact of one independent variable on the dependent variable in each hypothesis. The regression equation used is:

$$Y = a + b(X)$$

Where a and b are regression coefficients which are used to measure of how independent variable predicts dependent variable.

4.7. Hypothesis 1

Table 6 (a).: H1 - Model summary

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.555a	.308	.304	.3649732

Source: Authors.
a. Predictors: (Constant), SeA

The Model Summary of independent variable Self-Awareness (SeA) & dependent variable Managerial Effectiveness (ME) provides that there is positive linear relationship with 30.8% of variance.

Table 6 (b).: H1 - ANOVA table

	Model	Sum of squares	df	Mean square	F	Sig.
1	Regression	11.212	1	11.212	84.169	.000a
	Residual	25.176	189	.133		
	Total	36.388	190			

Source: Authors.
a. Predictors: (Constant), SeA

The ANOVA table provides the regression analysis, predicting Managerial Effectiveness (ME) from Self-Awareness. The results for the selected variables indicates the significance of F-test at 95% confidence interval. Since the Sig. value is 0.000 so independent variable Self-Awareness explains, variation in dependent variable (Managerial Effectiveness) significantly.

Table 6 (c).: H1 - Standardized & unstandardized coefficients for ME

		Unstandardized coefficients		Standardized coefficients		
	Model	B	Std. error	Beta	t	Sig.
1	(Constant)	1.676	.233		7.191	.000
	SeA	.547	.060	.555	9.174	.000

Source: Authors

The Coefficient of the test indicate that the t values associated with Self-Awareness is significant at the same level of F statistics. The regression equation will form the following shape:

ME = 1.676 + 0.547 (SeA)

Hence, we accept the H1: **Self-awareness leads to Managerial Effectiveness**

4.8. Hypothesis 2

Table 7 (a).: H2 - Model summary

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.542a	.293	.289	.3688789

Source: Authors.
a. Predictors: (Constant), SeM

The Model summary of independent variable Self-Management (SeM) & dependent variable Managerial Effectiveness (ME) provides that there is positive linear relationship with 29.3% of variance.

Table 7 (b).: H2 - ANOVA table

	Model	Sum of squares	df	Mean square	F	Sig.
1	Regression	10.670	1	10.670	78.415	.000a
	Residual	25.718	189	.136		
	Total	36.388	190			

Source: Authors.
a. Predictors: (Constant), SeM

The above table provides the regression analysis, predicting Managerial Effectiveness (ME) from Self-Management. The results for the selected variables indicates the significance of F-test at 95% confidence interval. Since the Sig. value is 0.000 so independent variable Self-Management explains, variation in dependent variable (Managerial Effectiveness) significantly.

Table 7 (c).: H2 - Standardized & unstandardized coefficients for ME

		Unstandardized coefficients		**Standardized coefficients**		
	Model	B	Std. error	Beta	T	Sig.
1	(Constant)	2.000	.205		9.758	.000
	SeM	.488	.055	.542	8.855	.000

Source: Authors.

The Coefficient of the test indicate that the t values associated with Self-Management is significant at the same level of F statistics was. The regression eq will form the following shape:

ME = 2.00 + 0.488 (SeM)

Hence, we accept the **H2: Self-management contributes positively to Managerial Effectiveness**

4.9. Hypothesis 3

Table 8 (a).: H3 - Model summary

Model	**R**	**R square**	**Adjusted R square**	**Std. error of the estimate**
1	.292a	.085	.080	.4196621

Source: Authors.

Table 8 (b).: H3 - Model summary

Model	**R**	**R square**	**Adjusted R square**	**Std. error of the estimate**
1	.292[a]	.085	.080	.4196621
a. Predictors: (Constant), SoAavg				

Source: Authors.

The Model summary of independent variable Social-Awareness (SoA) & dependent variable Managerial Effectiveness (ME) provides that there is positive linear relationship with 8.5% of variance.

Table 8 (c).: H3 - ANOVA table

	Model	Sum of squares	Df	Mean square	F	Sig.
1	Regression	3.102	1	3.102	17.611	.000a
	Residual	33.286	189	.176		
	Total	36.388	190			

Source: Authors.
a. Predictors: (Constant), SoAavg

The above table provides the regression analysis, predicting Managerial Effectiveness (ME) from Social-Awareness. The results for the selected variables indicates the significance of F-test at 95% confidence interval. Since the Sig. value is 0.000 so independent variable Social-Awareness explains, variation in dependent variable (Managerial Effectiveness) significantly.

Table 8 (d).: H3 - Standardized & unstandardized coefficients for ME

		Unstandardized coefficients		Standardized coefficients		
	Model	B	Std. error	Beta	T	Sig.
1	(Constant)	2.759	.250		11.040	.000
	SoA	.258	.061	.292	4.197	.000

Source: Authors.

The Coefficient of the test indicate that the t values associated with Self-Management is significant at the same level of F statistics. So, the regression eq will form the following shape:

ME = 2.759 + 0.258 (SoA)

Hence, we accept the **H3: Social awareness has a positive influence on Managerial Effectiveness**

4.10. Hypothesis 4

Table 9(a).: H4 - Model summary

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.357a	.128	.123	.4097873

Source: Authors.
a. Predictors: (Constant), ReM

The Model summary of independent variable Relationship Management (ReM) & dependent variable Managerial Effectiveness (ME) provides that there is positive linear relationship with 12.8% of variance.

Table 9(b).: H4 - ANOVA table

	Model	Sum of squares	df	Mean square	F	Sig.
1	Regression	4.650	1	4.650	27.689	.000a
	Residual	31.738	189	.168		
	Total	36.388	190			

Source: Authors.
a. Predictors: (Constant), ReM

The above table provides the regression analysis, predicting Managerial Effectiveness (ME) from Relationship Management. The results for the selected variables indicates the significance of F-test at 95% confidence interval. Since the Sig. value is 0.000 so independent variable Social-Awareness explains, variation in dependent variable (Managerial Effectiveness) significantly.

Table 9(c).: H4 - Standardized & unstandardized coefficients for ME

		Unstandardized coefficients		Standardized coefficients		
	Model	B	Std. error	Beta	T	Sig.
1	(Constant)	2.549	.239		10.645	.000
	ReMavg	.326	.062	.357	5.262	.000

Source: Authors.

The Coefficient of the test indicate that the t values associated with Relationship Management is significant at the same level of F statistics. So, the regression eq will form the following shape:

ME = 2.549 + 0.326 (ReM)

Hence, we accept the **H4: Relationship management leads to Managerial Effectiveness**

4.11. Hypothesis 5:

Table 10(a).: H5 - Model summary

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.622a	.387	.384	.3435460

Source: Authors.
a. Predictors: (Constant), EI

The Model summary of complete Model of Emotional Intelligence & dependent variable Managerial Effectiveness (ME) provides that there is positive linear relationship with 38.7% of variance.

Table 10(b).: H5 - ANOVA table

Model	Sum of squares	Df	Mean square	F	Sig.
1Regression	14.081	1	14.081	119.307	.000a
Residual	22.307	189	.118		
Total	36.388	190			

Source: Authors.
a. Predictors: (Constant), EI

The ANOVA table provides the regression analysis, predicting Managerial Effectiveness (ME) from Emotional Intelligence (EI). The results for the selected variables indicates the significance of F-test at 95% confidence interval. Since the Sig. value is 0.000 so model of Emotional Intelligence explains, variation in dependent variable (Managerial Effectiveness) significantly.

Table 10(c).: H5 - Standardized & unstandardized coefficients for ME

		Unstandardized coefficients		Standardized coefficients		
	Model	B	Std. error	Beta	t	Sig.
1	(Constant)	.632	.291		2.171	.031
	EI	.821	.075	.622	10.923	.000

Source: Authors.

The Coefficient of the test indicate that the t values associated with Relationship Management is significant at the same level of F statistics. So, the regression eq will form the following shape:

ME = 0.632 + 0.821 (EI)

Hence, we accept the **H5: Emotional Intelligence is considered as a scale of-Managerial Effectiveness**

5. CONCLUSION

"Emotional Intelligence" is one of the emerging topic among the researchers and practitioners of Human Resource Management. It shows much promise in the organizational domain and is worthy of further investigation (Rosete & Ciarrochi, 2005). The direction of ongoing researches for Emotional Intelligence was found towards the personal traits of any individual or leader such as emotionally intelligent leadership on talent retention, discretionary effort and employment brand (Palmer & Gignac, 2012). Since the focus of this research was to see the impact of 4 Emotional Intelligence domains by Goleman (1997) on the Managerial Effectiveness scale by Gupta (1996) and to generalize the results to include either the Emotional Intelligence collectively or any of the 4 domains in 16 Managerial Effectiveness scale.

5.1. Finding and discussion

The response rate of this research remained to 53.5% from our respondents which were achieved with full personal efforts due to the busy routine of our respondents. Since all the respondents were ranked to some managerial position therefore, were constantly followed-up for the response. Nearly 400 questionnaires were randomly distributed through email and in person among the managers of different levels of Banks and Mobile Service companies in the area of Rawalpindi, Islamabad, Lahore & Karachi. From the data of 191 managers we have concluded that all four domains of Emotional Intelligence namely Self-Awareness, Self-Management, Social-Awareness and Relationship Management have been found significant and also the collective impact as Emotional Intelligence, therefore suggested to include the trait of EI in the scale of Managerial Effectiveness developed by Gupta (1996).

The findings also suggests that the Managers higher on Emotional Intelligence likely to achieve business outcomes through their people. Regression analysis revealed that four domains of Emotional Intelligence independently and collectively have impact on the Managerial Effectiveness. These results may have important implications of Emotional Intelligence domains on Managerial Effectiveness for the inclusion in the scale however, caution must be given in making to wide a generalization of these findings, as the response rate is small at 53.5%.

Practically, a manager is always seems to be engaged with the variety of jobs at a same time and the most difficult is to handle annoyed and unsatisfied staff and customer. In such situation the traits and competencies such as emotional self-awareness, accurate self-assessment, self-confidence, Transparency, Adaptability, Opti-

mism, Empathy, Pay attention to the details of own relationships etc are very much influenced and needed for the effective management (Singh, 2013).

5.2. Limitations and future research directions

The research had some limitations that will need to be addressed in future research. It will be interesting to evaluate the link between EI and Managerial Effectiveness in larger samples, and across different industries. The research was focused on the service industry and should must be replicated in other diverse market environments such as manufacturing concern and overtime to increase the generalizability of the theory.

Secondly, it was observed that questionnaire was not very well understood by the respondents, as it was adopted from previously held researches conducted in different environments. Therefore, it is suggested that rephrasing of the questionnaire is required to retest the model again in the local environment.

Thirdly, the moderately skewed research results indicated that the tendency of the respondents were remained to some one side and when investigated it was found that most of the respondents in this research were from back office operations who have less interaction directly with customers. It is recommended that future research may be conducted with more of the frontline managers who have more versatile interaction with other people. A special emphasis can be further addressed to the categories of sector vise employees i.e. public and private sector.

Lastly, time and cost are a limitation for any research.

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THE ROLE OF TECHNOLOGY PARKS IN THE ENTREPRENEURIAL PROCESS: THE CASE OF TECHNOLOGY PARK VARAŽDIN

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ABSTRACT

Purpose. *The entrepreneurial process is a complicated structure defined by interaction of many factors. When analyzing entrepreneurship in the context of modern - day development of new technologies, technology parks are also being introduced in this process. Technology parks are specific forms which started their growth in the middle of twentieth century. They are viewed as places where technology, entrepreneurship, knowledge, innovation and creativity are being combined together in order to nurture the process of creating visions, ideas and new values. Technology parks are the nexus between academic community and ventures. The aim of this paper was to present the interaction between entrepreneurship and technology parks, and to identify the role of technology parks in today's entrepreneurial venture.*

Design. *Over time industrial economy has developed into information economy, which also has many forms. That lead to acknowledgement of the strength of connection between industry and know - how. Therefore this paper foremost defines the concepts of entrepreneurship and technology parks through their historic evolution and modalities of their interaction, that being the base for a case study. A case study was conducted in Technology park Varaždin in the period from March 7th to March 13th 2016, using following methods. Firstly secondary data analysis was conducted (data acquired from available literature and business reports) which gave basis for a decision regarding primary data collecting and hypotheses proposal. Afterwards primary data analysis was conducted (data acquired using online survey method). Survey was conducted on population consisting of entrepreneurs whose companies are tenants of Technology park Varaždin. The mentioned research survey consisted of twenty questions divided into four sections.*

Findings. *Total of three hypotheses were proposed and tested in order to make tenants profiles and analysis of their habitat in Technology park Varaždin, and finally in order to identify the role of Technology park Varaždin in their entrepreneurial process.*

1. INTRODUCTION

Entrepreneurship is a concept developed at the same time as the concept of creating a new value, and it is being redefined all over again along with the emerging of new knowledge, studies, theories and political systems (Bobera, Hunjet, Kozina, 2015, 15). Therefore, among many definitions of the term entrepreneurship, the one given by Jeffry A. Timmons sums up the essence of that process: the ability to create and build something from practically nothing (Hunjet, Kozina, 2014, 5).

The very person who engages into such entrepreneurial venture is the entrepreneur himself: it is a person who takes initiative, risk and seizes the opportunity that has presented itself. Entrepreneurial venture is a process consisting of four phases (Hisrich, Peters, Shepherd, 2011, 9): identification and opportunity assessment, business plan development, determining the resources needed and finally company management. That being said, it is obviously shown that special connection between entrepreneurship, creativity and innovation.

2. HISTORICAL BACKGROUND AND EVOLUTION OF ENTREPRENEURSHIP AND TECHNOLOGY PARKS

Historically, first entrepreneurial ventures are connected to the work of Marco Polo (13th and 14th century). The Middle Ages defines an entrepreneur as a person who performs the work and manages large projects, but does not take any risk. In the 17th century entrepreneurship is connected to the risk taking. In the 18th century, as a consequence of industrialization, the difference between the entrepreneur and the person funding the entrepreneurial venture is becoming increasingly obvious.

In the end of the19th century and in the beginning of the 20th century there is no difference between the terms "entrepreneur" and "manager", while in the middle of the 20th century entrepreneur is defined as an innovator as well.

In the 20th century, according to (Brusić, Cvitanović, Gregov, Kutnjak, Tomić, Žanić, 2009, 16-17) we can identify five different phases:

- 1950s to 1960s: domination of large companies, mass production and consumption, the role of the private entrepreneurship is insignificant
- 1960s to the middle of 1970s: in Japan and Taiwan increased role of the workforce in SMEs, which is not the case in highly developed European countries; the oil crisis and the consequent social situation affects the development of active employment and self-employment
- second half of the 1970s to 1990s: intensive development of the computer industry, the mass media, franchising and musical - entertainment industry in USA
- the period of 1990s: the so-called years of entrepreneurship; development of the entrepreneurship around the world

- the beginning of the 21st century: the flow of information through the Internet opened the possibility of globalization of small businesses and innovation became the main initiator.

The development of entrepreneurship in the Republic of Croatia was greatly influenced by the time spent in the political arrangements that did not know the concept of private ownership and entrepreneurial initiatives. Unfortunately, the consequences are still visible, especially as expressed in the lack of support of the administrative system, the education system and the perception of society in general. However, Croatia has a great tradition of artisan fraternities, guilds, unions and chambers (Hunjet, Kozina, Milković, 2012, 103-115).

Today, the Croatian entrepreneurship is increasingly relevant, and that is one of the consequences of joining the EU and opportunities for access to their acquired knowledge, experience and certainly financial assistance (Hunjet, Kozina, Kurečić, 2015, 620-629). The entrepreneurial process is carried out through several forms of legal persons, which is under the provisions of the Companies Act.

Looking at the evolution of the concept and content of entrepreneurship is obvious that global connectivity and availability of information, contacts and opportunities influenced the modern concept of entrepreneurship. It is particularly visible enormous expansion in the field of technological entrepreneurship, which is quite logical consequence of the ubiquity and availability of technology.

In this sense, it is extremely important notion of startup entrepreneurship. The term startup entrepreneurship appeared some ten years ago, and is primarily associated with technological entrepreneurship and dot - com bubble era. The emergence of the term is associated with the area of the United States, but the exact definition does not exist. U. S. Small Business Administration defines a startup as a business that is typically technologically oriented and has great growth potential (https://www.sba.gov/content/startups-high-growth-businesses). According to Steve Blank, startup is defined as a temporary organization which aims to create a model that can be repeated and have a tendency to increase (http://steveblank.com/2010/01/25/whats-a-startup-first-principles). Blank further argues that the startup entrepreneur begins his enterprise with a certain vision and a series of hypotheses about the product, customer, price, distribution channel - and must as soon as possible check the viability of his imaginary model.

Eric Ries defines a startup as an institution that was founded to create a new product or service in conditions of great uncertainty (Ries, 2013, 25). The key is that the product or service offered by startup is something innovative, that is new and associated with progress in every aspect. Ries further stresses that the startup venture has particularly emphasized the human factor, because this human factor is exactly what links the idea, technology, progress and development of the uncertainty that characterizes the startup.

In conclusion, the startup is a concept whose main activity is in connecting in-

novative ideas with reality and transforming them into products or services, but in a specific modus by studying the reaction of target consumers and requiring their feedback, with the aim of identifying optimal operations.

It is obvious that the concept of the entrepreneurship has changed over time, but it certainly kept its basic characteristic - the desire and need for risk-taking and the creation of something new. In today's context, entrepreneurship is increasingly linked with the power of new technologies and knowledge about them. Precisely on this basis of joint technological achievements and formal education, knowledge and science technology parks were created.

The terms technopol, technology parks, science parks, research parks are being widely used as synonyms. Technopolis are according to M. Castells and P. Hall defined in few basic forms, that being: facilities with high tech design; science parks (and towns); technology parks; complete technopolis who are instruments of regional development and decentralization; metropolis of the industrial world (Castells, Hall, 1994, 56). In this sense, we can actually talk about synonyms, since each of the proposed expression is characteristic of a certain part of the world. Thus, the term Research Park is characteristic in the United States, Science Park in Europe, a technology park in Asia. According to other authors, we can talk about the "British model" which is characterized by the name science park, and "Mediterranean model" characterized by the name technology park (Vilà, Pagès, 2008, 142-149). Quoted authors state that in the European area both terms scientific and technological parks coexist, and there are no major differences in their concepts. One point of divergence would be their size - scientific parks are generally smaller and the main purpose is scientific research, while technology parks are larger and support production. Common to all these different names is a public - private partnership that supports the flow of knowledge, usually between tenants and higher education institutions, and contributes to regional economic growth.

The important role of technology parks is evident in the fact that since 1984 operates International Association of Science Parks and Areas of Innovation - IASP, worldwide network of science parks and innovation areas, which has the status of a special consultant with the Economic and Social Council of the United Nations. This organization defines science parks as an organization guided by specialized professionals, whose main aim is to increase welfare of the community by promoting the culture of innovation and competitiveness and all of that through activities of its related business and educational entities.

Technology parks represent a planned, designed and organized units that have a fully equipped space in terms of infrastructure and other forms of assistance and support. Its customers, often labeled as "tenant" are offered various forms of assistance and benefits (office space, equipment, intellectual services, all with minimal financial participation), with the aim of developing the ideas from the phase of formation and incubation, to the stage of the finished product ready for the market.

They are being established and developed in collaboration with higher education institutions, and thus represent a link between knowledge, education, high technology and entrepreneurship.

According to I. Žuvela we can identify the generally accepted goals of technology parks, as follows:

(a) the creation of new forms of cooperation between scientific research and modern production, thus more quickly transmitted scientific results in an economic area

(b) a method of modernization leads to the acceleration of restructuring of the existing industry

(c) they accelerate the development of the entire region through job creation, infrastructure, by raising the scientific and cultural standards

(d) they are raising the level of corporate culture and ethics (Žuvela, 1993, 67).

Technology parks have no strictly defined organizational form, but we can talk about the theory of technology parks.

According to the European Commission report prepared by the Directorate General for Regional and Urban Policy there are two concepts of technology parks (http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/stp_report_en).

The first is the "triple helix" concept which is generally associated with the concept of science parks, and involves a creative interaction between government, universities and research centers and businesses (business), and the addition of market / society creates the concept of "quadruple helix".

Another concept puts the eight criteria for creating successful scientific - technology park, and the most important criteria being the need of support by the national and regional economic - development policies, necessary connections and networking of all residents. Such parks should be considered passageway, which lead to a business opportunity, but not a destination.

Historically technology parks are created following the idea of clusters. Already in the late forties and fifties of the 20th century some of the first forms of technology parks were created: Menlo Park, the Stanford Industrial Park (now the Research Park) which was the forerunner of what is now known as Silicon Valley. Silicon Valley today represents the area of greatest concentration of high-tech innovators of the IT sphere.

The first technology park is considered to be the University City Science Center, founded in 1963 by the University of Philadelphia.

Although at first beginning of technology parks was linked to the area of the United States, in Europe universities of Canfield and Cambridge recognized the American idea, but it took a while until in the 1980s intervention of the British government encouraged coordination of universities and industry.

In the period from 1970 to 1984, the first truly European technology park was created: Sophia Antipolis in France, which is primarily focused on the area of computing, electronics, pharmacology and biotechnology. During this period a series of technology parks was founded, the so-called Centers Regionaux innovation et de Transfer de Technology.

In the early eighties of the 20th century the first technology parks in Italy (Trieste) and Germany (Heidelberg) were founded.

In Spain, in 1985 the Bilbao Technology Park was founded, but only in 1996 when the Barcelona Science Park was founded, academic community became involved in the operation of technology parks.

Of course, development was visible in the Asian region. In the 1990s financial institutions recognized the importance of investment and support of the technology centers, parks, incubators of knowledge.

According to John Allen (2007, Third Generation Science Parks, Manchester Science Parks, Manchester, UK) there is a concept of three generations of scientific and technology parks (http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/stp_report_en.pdf):

(a) The first generation - parks established before and during the 1980s of the 20th century, characterized by the landscaped environment with quality buildings, connection to higher education institutions, and active links with higher education institutions in the field of technology transfer and innovation but only within companies - residents

(b) The second generation - parks established in the 1990s of the 20th century, who began to spread range of services offered by the residents especially those involved in the startup and early stage technology businesses, and strengthening pro-active connections (networks) that support innovation

(c) Third Generation - 2006 at a workshop in Manchester thirty leaders of technology parks, academic researchers, consultants and persons working on development met and concluded that the third generation is characterized by all the characteristics of a good fleet of second-generation, and in addition to the creation and organization of quality physical environment that will encourage a high level of creativity and innovation.

The first technology park in Croatia was founded in 1993, as a society called KONČAR - Technology Park Ltd., which began with the work in 1994. Today it is a society known as the Technology Park Zagreb. The first director Marijan Ožanić in his book "The work of the Technology Park Zagreb - 10 years of development" describes the confusion and misunderstanding of the public (and even business) about the very concept and purpose of such companies (Ožanić, 2004, 12).

The actual investment in technology infrastructure in Croatia started in 1998. In Croatia there are seventeen technology parks and business incubators, of which the most important technology park, Technology Innovation Center Rijeka was created in 1997. As numerous studies show, technology parks have undoubtedly contributed in economic growth and development and entrepreneurship in general.

3. CASE STUDY- TECHNOLOGY PARK VARAŽDIN

Research was carried out in which the participating were legal entities - tenants of the Technology park Varaždin who are participants in the incubation process. It is possible to enter the technology park in the incubation process, and in the form of commercial tenants. Commercial tenants are those who do not meet the conditions for the incubation process, and therefore are not of interest for this study.

The research topic was to create a profile of tenants of Technology park Varaždin and analyze their "housing" in the present park, with the aim of determining the role of the Technology park Varaždin in the development of their entrepreneurial venture.

4. RESEARCH METHODOLOGY

The study was conducted by analyzing secondary data from the available literature and publicly published reports of the Technology park Varaždin, as well as information on the legal form of the tenants that are obtained by examining the appropriate public registers. The analysis of these secondary data prepared the foundation for the formation of ways of collecting primary data and proposal of hypothesis (Ivetić, 2016, 32-66).

Furthermore, research was conducted by analyzing the primary data collected by the questionnaire that has been created on the Google Spreadsheets service. It should be noted that the legal entity tenants of Technology park Varaždin were referred to using the term "tenant".

The survey questionnaire consisted of a total of twenty questions. Questions were grouped as follows:

- The first group of questions was used for profiling tenants (the duration of business, number of employees, the primary activity, duration of residence in the Technology park) with which data secondary data essential for tenants was associated
- the second set of questions were used to identify the reason for entry into the Technology park, grade the severity of administrative requirements; identify the expectations and level of fulfillment of expectations, and define the maximum benefits and the greatest lack of housing
- the third group of questions was used to evaluate degree of logistical support

of the Technology park Varaždin and identify the required services that are not currently offered

- the fourth group of questions was used for evaluating claims related to the affect of housing in the Technology park on entrepreneurial venture of its tenants.

The survey was conducted during the period from 7th to 13th March 2016 in such a way that the tenants of the Technology park Varaždin were invited to fill out the questionnaire via the enclosed online forms (Ivetić E., 2016, 32-66). Call for filling the questionnaire was sent to thirty-one occupant, and feedback was given by fourteen occupants. Regarding the specific target group of the study, it is considered that the resulting sample represents 45% of the target population and thus is representative and valid.

The following hypotheses were proposed:

(1) Technology park has met the expectations of tenants

(2) Entering the incubation process is not overly burdened with the administrative requirements

(3) Housing in the Technology park has positively affected entrepreneurial venture.

5. RESULTS OF THE SECONDARY DATA ANALYSIS

Such secondary data are the basis of this study, therefore, are exposed in the following order.

Technology park Ltd. is in form of a limited liability company, with the primary activities being: incubation center for innovative startup companies, establishment of a mechanism for improvement of existing technologically innovative companies, improving knowledge transfer with universities and development centers into the economy, networking companies, educational institutions, development agencies and innovative individuals, and changing the perception towards innovation as a foundation of a new economy. As to ownership structure, to crowners are City of Varaždin, Faculty of Organization and Information Science and the University North. From the register of visible is a list of activities, of which stand out the following: business control, providing advice and assistance to businesses and public services in planning, organization, efficiency and control, management information, advising management; encourage research and development in the field of technological and natural science; promotion of business cooperation, technology transfer and commercialization of research results. From the foregoing, it is evident that according to all supra mentioned iregarding characteristics and activities of technology parks, Technology park Varaždin really belongs to the category of technology parks. This project was started in 2003.

The conditions for entry into the incubation process are as follows:

- project in the field technology that has the intention of establishing some form of legal personality, with the advantage of having activities in the field of new technologies (ICT, biotechnology, nanotechnology),
- project under consideration may be in one of the following forms: - an innovator or an individual with an entrepreneurial startup idea- company - existing company (up to 4 employees) which is in phase of growth or change of activity in relation to the technology of interest- company that is launching a new project, and run the incubation of only one segment - a new spin-off company or subsidiary of a firm located outside Varaždin whose activity corresponds to that mentioned above; a new product or a new service that is going to be developed or improved should be able to commercialize within at least two years
- candidates usually need to have a concept of the business plan, and elaborate financial scheme
- the candidate must demonstrate the ability to lead and project management, skills; the candidate must employ new workers, and demonstrate the ability to pay monthly expenses
- applicants must be prepared for coexistence in incubation space and must be able to promote projects of other tenants and institutions of Technology park Varaždin.

In addition to the incubation process, Technology park Varaždin offers as well preincubation process in terms of identifying the commercial components of technologically innovative projects, and implementation of the preincubation activities for the purpose of entering the incubation.

Incubation process includes the following segments:

(1) Accommodation: privileged price in a way that: - the first year of residence in the TP Varaždin tenants pay 25% of the market price, the second year 50% of the market price, third year 75% of the market price, and the fourth year of full market price; the first year of residence in the CEC (a part of Technology park Varaždin) is fully free, the second year is paid 25% of the market price, third year 50% of the market price in the fourth year 75% of the market price, and the fifth year of full market price.

(2) Assignment of the necessary infrastructure: Internet access, meeting rooms, conference hall, presentation equipment, video camera and digital camera (free for all tenants), fax machine is free for all tenants, 3D equipment

(3) The improvement and development of the tenants company: while entering the incubation process each tenant gets a mentor, who works daily with the tenant.

(4) Upgrading and development projects: development of the project, market analysis; assisting in financial analysis and networking with other tenants, companies and educational institutions.

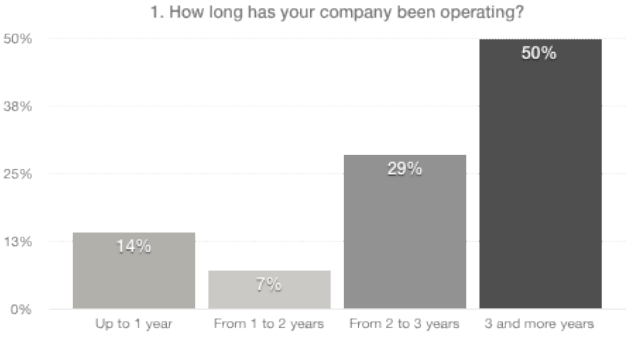
The next phase is post incubation process - period after the company ended its incubation process. Further cooperation includes preparations for the successful completion of incubation, finding new locations and adequate maintenance. As well there are offered services like motivation and awareness, marketing and PR, creative workshops, networking, conferences, counseling.

According to the results of secondary data analysis it is concluded that Technology park Varaždin is active in the field of promoting the development and transfer of knowledge, which is done through participation in various projects, by providing an adequate infrastructure to its tenants and the development of new concepts and business ideas.

6. RESULTS OF THE PRIMARY DATA ANALYSIS

Below are presented the results obtained by a questionnaire survey. The introduction refers to the legal form of the respondent's limited liability company, which is determined from the secondary data (by checking the appropriate registers). Results are displayed graphically and in tabular form, so that they can be quantified. Technology park Varaždin is referred to as TP Varaždin (Ivetić, 2016, 32-66).

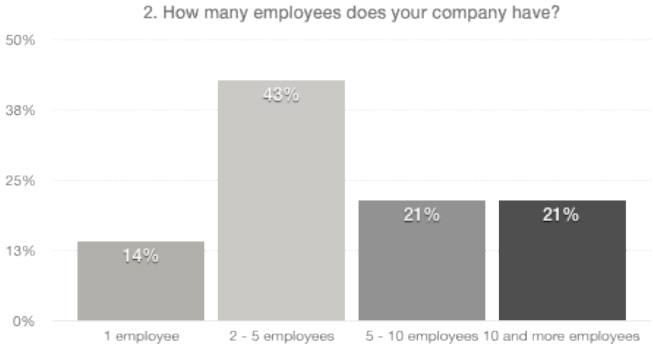
Figure 1.: Duration of operations



Source: Authors.

The results show that the largest proportion of respondents - 50% are operating three or more years, 28.6% are operating from two to three years, 14.3% are operating to one year, and 7.1% are operating from one to two years.

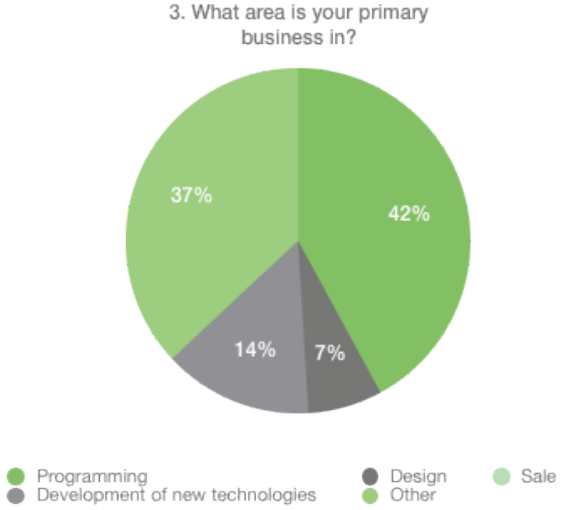
Figure 2.: Number of employees



Source: Authors.

The results show that the largest proportion of respondents, 42.9% have from two to five employees and an equal share of the 21.4% of respondents have employed five to ten, or ten or more employees. Only 14.3% of respondents have one employee.

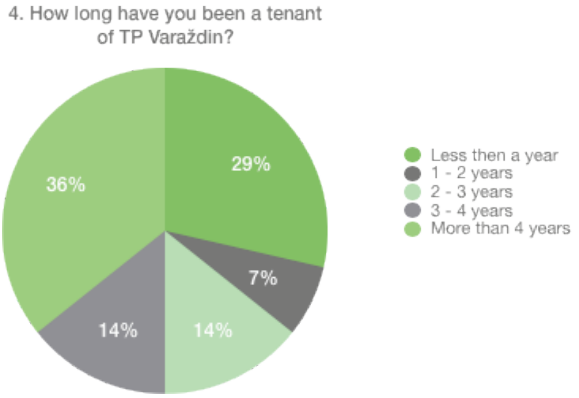
Figure 3.: Primary business area



Source: Authors.

The result show that the largest proportion of respondents, 42.9% are primarily engaged in programming, while 37.7% said the category "Other"; 14.3% of respondents are engaged in primarily the development of new technology, and 7.1% in design.

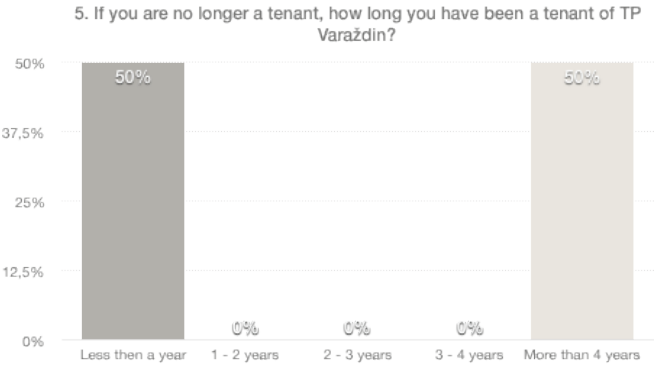
Figure 4.: Duration of the tenancy



Source: Authors.

The results show that the largest proportion of respondents, 35.7% have been a tenant in TP Varaždin more than four years, 28.6% less than a year, the same proportion of 14.3% have been a tenant from three to four years, and the lowest percentage of respondents, 7.1% are in TP Varaždin from one to two years.

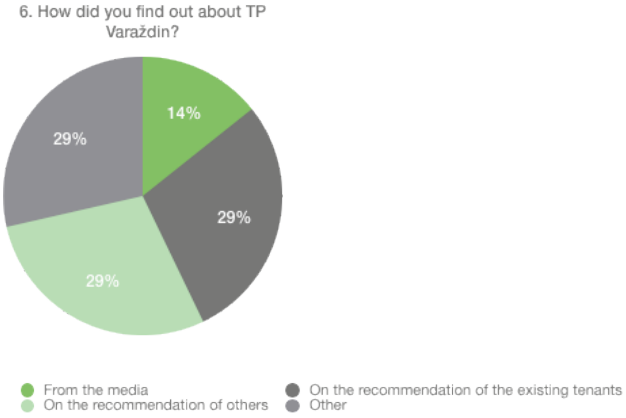
Figure 5.: Duration of the previous tenancy



Source: Authors.

Out of the fourteen tenants, two in the meantime completed the process of housing in TP Varaždin, where one respondent was a tenant under a year, one more than four years.

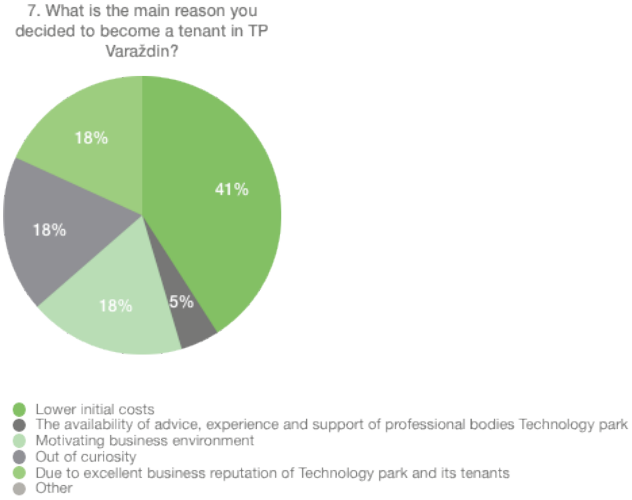
Figure 6.: Source of information



Source: Authors.

The results show that the respondents primarily learned about TP Varaždin through referrals of existing tenants, by the recommendation of other tenants or otherwise. The smallest share of respondents found out about the TP Varaždin from the media.

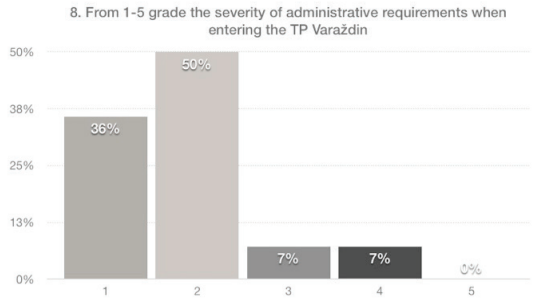
Figure 7.: Reason for entering into TP Varaždin



Source: Authors.

The results show the primary reason for entering the TP Varaždin - lower initial costs, but the least relevant reason is availability of support.

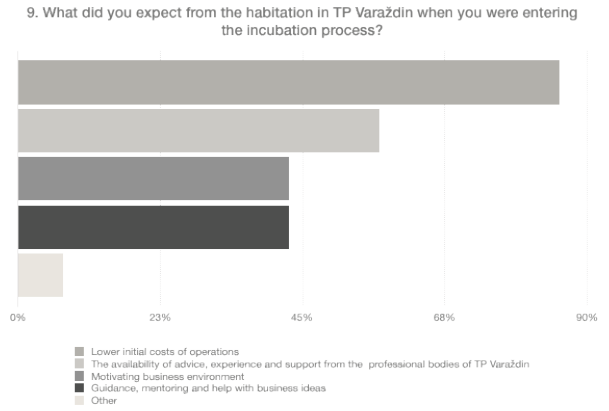
Figure 8.: Severity of administrative requirements



Source: Authors.

The results show that half of respondents are ranking the weight of administrative requirements with grade 2, and the average score is 1.42. Taking into account that the score 1 represented very simple requests, and 5 extremely difficult, it is evident that the average score expresses simple requests.

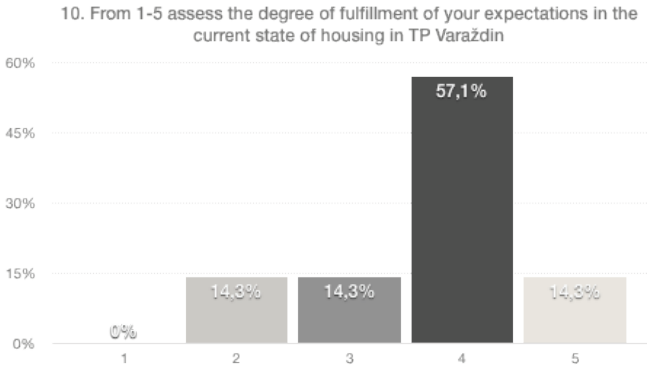
Figure 9.: Expectations



Source: Authors.

The results show that the respondents primarily expected lower initial costs, and then the availability of advice and support of professional bodies. 42.9% of respondents expected motivating business environment.

Figure 10.: Expectation fulfillment



Source: Authors.

The results show that the largest proportion of respondents rated the degree of fulfillment of the expectations with grade 4, and the average score is 3.71. Taking into account that the score 1 represented a failure to fulfill expectations, and 5 absolute fulfillment of the same, the average score expresses the fulfillment of expectations.

11. Write concisely what you think is the greatest benefit of your housing in TP Varaždin

Table 1.: Greatest benefits

Networking and low cost
Company of professionals
Free parking
A large number of companies situated in TP
Motivating business environment
Business environment
Internet
Location
Motivating business environment, networking
Networking
Other companies situated in TP, rent
Low cost
Virtual office

Source: Authors.

The results show that as the greatest benefits are identified networking (establishing personal and business links), business environment, and the cost and location.

12. Write concisely what you think is the greatest defect of your residence in TP Varaždin so far?

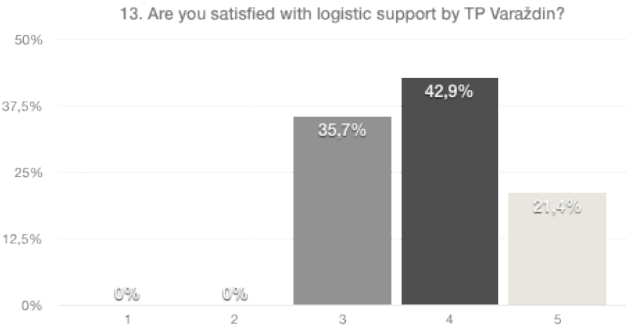
Table 2.: Greatest defects

Offices must be renovated, we need new network equipment
We can't brand our company
We need a larger conference room and activity room
Rent after the incubation process, lack of space
We need a restaurant
No space for leisure
No space for leisure (such as a shared kitchen)
We need stronger cooperation between tenants; workshops
We need more joint projects between the tenants
None

Source: Authors.

The results show that the greatest defects of previous residence are lack of adequate office space and lack of space for leisure.

Figure 11.: Logistic support



Source: Authors.

The results show that the largest proportion of respondents rated satisfaction with logistic support with grade 4, and the average score is 3.85. Taking into account that the score 1 represents dissatisfaction and 5 absolute satisfaction, the average score expresses satisfaction with logistic support.

14. Write concisely what would you add to the list of services offered by TP Varaždin

Table 3:. List of required services

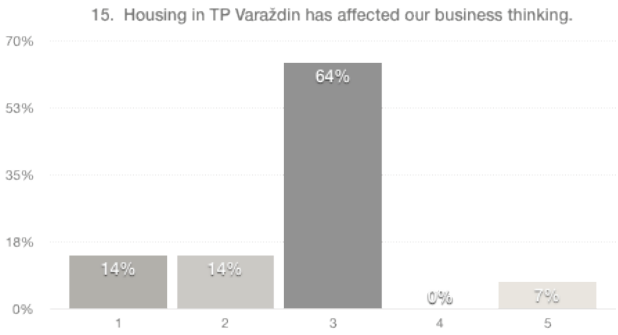
New IT equipment
Common areas (kitchen), new sanitary infrastructure
Testing equipment (cell phones, gadgets), servers
The possibility of contracting a cleaning service
More education and specialized workshops
Kitchen, parking space
Restaurant
Cleaning service, legal advice, showcase of tenants projects
Equipment rent
IT equipment rent
None

Source: Authors.

The results show the greatest interest in the availability of specialized equipment, organizing kitchen, restaurant and cleaning services.

Rate the following statements (15. - 20.) on a scale from 1 (completely false) to 5 (completely true):

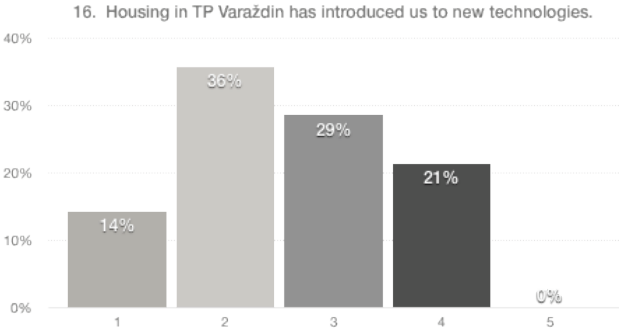
Figure 12.: Impact on business thinking



Source: Authors.

The results show that the largest share of respondents assessed the impact of housing in TP Varaždin on business thinking with grade 3, and the average score is 2.71. Average score therefore expresses the average power of influence.

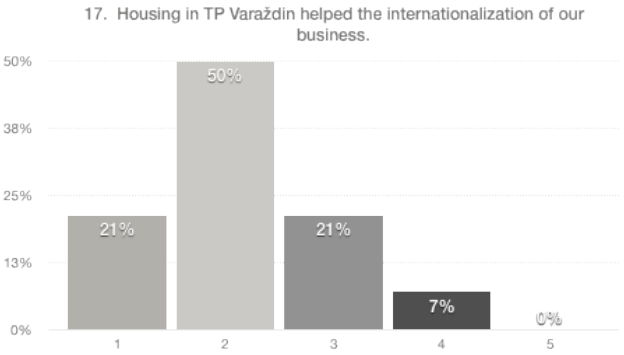
Figure 13.: Impact on the introduction of new technologies



Source: Authors.

The results shows that the largest proportion of respondents rated the degree of influence of housing in TP Varaždin on the introduction of new technologies with grade 2, and the average score is 2.57. Average score therefore expresses the average power of influence.

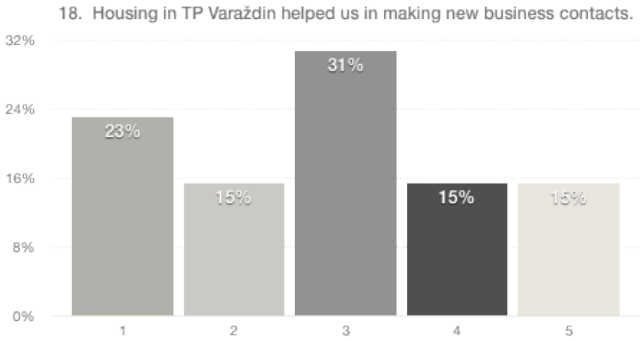
Figure 14:. Impact on the internationalization of business



Source: Authors.

The results show that the largest proportion of respondents rated the degree of influence of housing in TP Varaždin on the internationalization of business with grade 2, and the average score is 2.14. Average score therefore expresses a very bad influence.

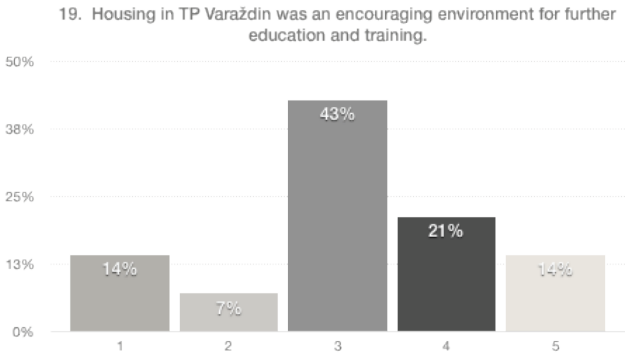
Figure 15.: Impact on the creation of new business contacts



Source: Authors.

The results show that the largest proportion of respondents rated the degree of influence of housing in TP Varaždin on achieving business contacts with grade 3, and the average score is 2.64. Average score therefore expresses the average power of influence.

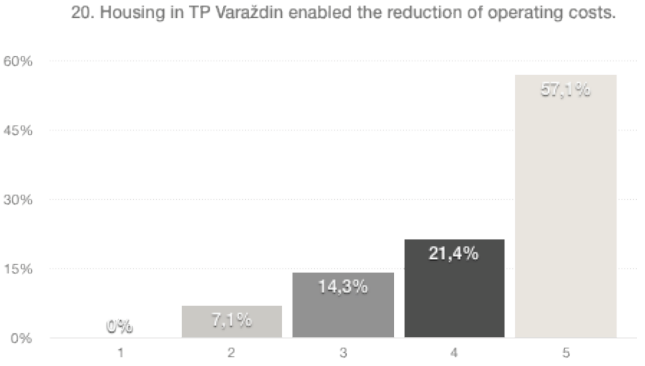
Figure 16.: Impact on further education



Source: Authors.

The results show that the largest proportion of respondents rated the degree of influence of housing in TP Varaždin on further education with grade 3, and the average score is 3.14 The average score therefore expresses the average power of influence.

Figure 17.: Impact on cost reduction



Source: Authors.

The results show that the largest proportion of respondents rated the degree of influence of housing in TP Varaždin in reducing operating costs with grade 5, and the average score is 4.28. The average score therefore expresses a high power of influence.

7. ANALYSIS OF RESULTS AND PROCESSING OF THE HYPOTHESIS

Given the research conducted, and the combined primary and secondary data, the following is concluded. On the basis of the first group of questions from the questionnaire it is determined that 50% of respondents operate three or more years, with the largest proportion of respondents' employ from two to five employees. The primary activity of the respondents programming, followed by other activities, and in third place in the representation of developing new technologies. From the results it is evident that the profile of tenants is corresponding to profiles which are discussed in theory and comparative practices - this is mostly about small businesses or micro enterprises.

On the basis of the second group of questions reasons for joining the Technology park were identified. The primary reason is lower initial costs, while the least relevant reason is professional bodies support. Results are associated with the current economic and social situation, which is extremely unfavorable for starting a new job, and this in the context of high costs and administrative barriers. From the research results it can be concluded that the respondents decided to enter the technology park just because of the possibility of bridging these two reasons - lower initial cost and very simple administrative requirements when entering the system incubation. Furthermore, the identified expectations and the degree of fulfillment of expectations when entering the incubation process, where it can be seen that the tenants primarily expected lower start-up costs, and then the availability of advice and sup-

port of professional bodies, in that respondents were satisfied with the fulfillment of expectations in the current phase of its housing. Defined are the biggest benefits of the former residence- primarily networking, business environment, low cost and convenient location. At the same time as the greatest shortcomings of previous residence the majority of tenants identified lack of adequate space.

On the basis of the third group of questions it was expressed the degree of satisfaction with the logistic support and it was identified the need for services that are currently not yet available. The list of proposals of such services include the need for new equipment, organized food and service cleaning offices. Results are associated with the current project extension TP Varaždin, and the announced investment in infrastructure.

On the basis of the fourth group of questions it was identified the influence of housing in Technology park Varaždin on business and related activities. It was expressed average impact on business thinking, introduction of new technologies, establishing business contacts and further education. A great impact was expressed on the reduction of operating costs, and extremely bad impact on the internationalization of business.

Hypothesis 1: The Technology park has met the expectations of tenants

The hypothesis is accepted. Analyzing the results of the questionnaire shows that the tenants when entering primarily expect lower operating costs and availability of advice and support from professional bodies. The greatest benefits of previous residence are considered networking, business environment and lower operating costs. Responding to a direct question about the degree of fulfillment of the expectations it was expressed a high degree of fulfillment of expectations.

Hypothesis 2: Entering the incubation process is not overly burdened with the administrative requirements

The hypothesis is accepted. Analyzing the results of the questionnaire revealed current simple administrative requirements when entering the incubation process, and expressed satisfaction with the provided logistic support.

Hypothesis 3: Housing in the Technology park has positively affected entrepreneurial venture

The hypothesis is accepted. The analysis of rating statements related to the impact of housing determined the average power of influence on the positive aspects of business development, in terms of impact on business thinking, introduction of new technologies, establishing business contacts and further education. As expected, the greatest impact was shown on reducing operating costs, which is again associated with the current economic situation. However, it was shown surprisingly low power impact on the internationalization of the business, but also bringing this into the context of the current economic situation we can conclude that the primary goal of these entrepreneurs was to keep their business alive, while the internationalization was only potential additional benefit.

8. CONCLUSION

The results of the study show that Technology park Varaždin has a role in the entrepreneurial process of its tenants, and meets their expectations. However, it is necessary to work on the development of infrastructure, and enabling the creation of a complete range of business and supporting informal content. In addition, it is necessary to work on media exposure, which is quite unexpected given the very function of the Technology park and its links with modern technologies. Without additional efforts the role of Technology park Varaždin could be reduced to the purpose which, unfortunately, has a large number of Croatian technology parks and centers - an area that generates lower operating costs.

The hypothesis were made according to the resulted of the survey which was made on the small sample; only 14 occupants. The Technology Park Varaždin had only 14 tenants and that is the reason for such a small sample.

It is recommended to extend the research of other technological parks in Croatia and in Europe.

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