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IS WAGNER'S LAW APPLICABLE FOR FAST GROWING ECONOMIES? BRICS AND MATIK COUNTRIES

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This study investigates the causality relationship between public sector spending and economic growth. Although a relationship between these two variables is traditionally accepted, the direction of this causality relationship has widely been discussed. The relationship in which the increase of public sector spending moves together with the growth is called as Wagner's Law and it is examined through developing countries' data. As being developing country group, there is a huge literature about "BRICS countries". The unique contribution of this study is that it defines a new developing country group as "MATIK countries" and it analyzes BRICS and MATIK (BM) countries together. Therefore, the validity of Wagner's Law is tested on economic growth and public spending figures of these country groups which have significant population and economic size in world economy. As a result of Granger Causality Test for the period of 1961-2013, findings are obtained as Wagner's Law is not valid for majority of BM countries, which include 10 high growing economies. This conclusion is compared with other studies, which are conducted for developing countries.

Keywords: **Wagner Law, BRICS and MATIK Country, Economic Growth.**

JEL Classification: **F43, H11, H50.**

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1. Introduction

Classical and Neo-Classical Economy are highly consistent on the subject of limiting and minimizing the public sector's activities during the growth processes. Keynes claimed that market mechanisms could not be balanced by itself, and public sector activities are necessary to remove these conditions after 1929 crisis. The share of public sector in the total economy had been increased till 1970s and growth processes had also included the public sector's activities after this hypothesis. Through 1980s this hypothesis of Keynesian economy was left so that the suggestions of neo-classical economy are started being accepted. However, the relationship between public sector activities and the economic growth has still being discussed. On the basis of the disagreements, there is the possibility that public sector's activities could have different effects depending on the development level of the countries which are examined. The second difference is public sector activities have different types. For example, public revenues are mostly depended on direct taxes in the developed countries while they are depended on indirect taxes in many of the developing countries. Different results can be reached through analysis due to these and these kinds of differences. The analyses which are based on the relationship between different public sectors activities and the growth could give different result similarly. The most commonly known relationship between the public spending which is one of the most important activities of the public sectors and the economic growth is brought forward by A. Wagner (1883) so that this is called as "Wagner's Law (Henrekson,1993).

Wagner associated this relationship to i) cultural and welfare improvement ii) administrative and preventing functions iii) spending toward to economic interruptions and firstly to natural monopolies (Bird, 1971; Tornton, 1999; Biehl, 1998). After Wagner, different many explanations are done for the increase of public spending. For example, the reason of the increase of public spending is associated with the governmental spending campaigns for low income voters and the source of the increase is seen in this point (Meltzer and Richard, 1981; Persson ve Tabellini, 1990). As a more general causalization, Masgrave (1969) commented that the increase rate of public spending would be much more than the rate of national income through the fact that education, health and public properties' rates are increased faster depending on the national income increase than shelter, food and clothing spending rates. There is a relationship between public spending and GDP increase per person in internal growth model of Barro (1990) and according to fixed contribution assumption of private sector and public services, the magnitude of public sector is effective in opposite direction on the growth rate. According to Barro (1991), public investments have positive effects on the growth rate due to raise the productivity while public spending affects the growth rate negatively.

In the relationship between public spending and the economic growth, there are two main approaches which belong to Keynes and Wagner. The difference among Keynes and Wagner hypothesis is about causality direction (Chi-Hung and Chiehwen 2008). Keynes claimed that the increase of public spending will cause the growth while Wagner claimed that the growth will cause the increase of public spending. Both of those approaches are testes many times. Some of the studies gathered proofs about the invalidity of Wagner's Law (e.g. Ram (1986), Afxentiou and Serletis (1996); Wahab (2004)) as many studies found results about the validity of Wagner's Law. The main reason of this difference in the literature is stemmed from the fact that the perspectives and the explanatory variables were highly different in the conducted studies. Different arguments like the magnitude of the country (Alesina and Wacziarg, 1998); trade deficits (Rodrik, 1998); the differences of economic development levels (Easterly and Rebelo, 1993; Stein et al., 1999); political organization structures (Milesi Ferretti et al., 2002; Persson and Tabellini, 1999); the vulnerability level to economic uncertainties (Andres et al., 2008; Fatas and Mihov, 2001) could be effective on the results of the tests which are done for hypothesis. However in general, the relationship that Wagner claimed is more powerful in the developed countries and weaker in the developing countries (Akitoby et al., 2006).

The fact that population of the economies is constantly increasing and the increase of the welfare conditions of the individuals who are created by the economy's total growth will cause the increase of public spending by nature. The public spending which is about the welfare condition improvement will also determine the public revenues policy. Furthermore, public revenue is a function of the public spending as a budgeting principle. Moreover, an inconsistent spending policy will require increasing the tax revenues (Ram, 1987; Oxley, 1994). Therefore, this condition will create a pressure to direct and indirect tax payers and this can go further to smuggling (Barro, 1990; Roubini and Sala-i-Martin, 1995; Futagami, et al. 1993; Turnovsky, 1997). This pressure will narrow the individuals' spendable budgets and companies' profitability (Mishkin, 2011). Moreover, inflationist pressure will emerge due to the effects of taxes to manufacturing costs. In short, Wagner's Law is convenient to be discussed in all aspects of macroeconomic circle because it relates to cyclical relationship between public sector and the economic growth. I focus on the developing countries category in this study. There is a rich literature about the developing countries on the other hand due to the before mentioned reasons, different results are gathered. From this rich literature, the findings which belong to selected some studies which were conducted for selected country and country groups are provided in *Table 1*. As seen, these studies give some similar and some different results which relate to Wagner's Law.

This study is expected to make two important contributions to the literature. The first one is that this is the first study which examines BRICS economies for Wagner's Law. The second one is that Wagner's Law is tested as conducting analysis for each of two country groups by defining Mexico, Argentina, Turkey, Indonesia and Korea as "MATIK Countries" because

there are big similarities in terms of qualitative aspects and characteristics with BRICS country group although there are quantitative differences among them. Afterwards, BRICS and MATIK countries will be shortly called as "BM".

Table 1. Selected Country and Country Groups for Wagner's Law

Author(s)	Period	Country(s)	Conclusion
Afxentiou & Serletis (1996)	1961-1991	EU	Hypothesis is valid.
Campo (1998)	1980-1990	100 World countries	Positively associated with employment expenses.
Thornton (1999)	19th cc	6 Developed European Countries	Valid with a powerful relationship.
Islam (2001)	1929-1996	USA	Valid with a powerful relationship.
Blackley (2003)	1949-1998	USA	Spending other than interest is associated with the growth.
Iyare & Lorde (2004)	1953-2000	Caribbean Countries	Hypothesis is valid.
Florio & Colautti (2005)	1870-1990	USA, U.K., France, Germany, Italy	There is a relationship in the long run.
Akitoby et al. (2006)		51 Developing Countries	It is co-integrated with 70% of the countries.
Narayan et al. (2008)	1990-2003	China States	It is valid in Western States and is partly valid in Eastern States.
Ghartey (2008)	1960-2005	Jamaica	There is a relationship in the short run.
Furuoka (2008)	1970-2005	Malaysia	It is co-integrated in the long run.
Narayan (2008)	1970-2002	The Fiji Islands	There is Granger Causality in the long run.
Rufael (2008)	1964-2004	13 African Countries	Partly double directed, partly single directed and partly no causality.
Tang (2008); Tang (2010)	1960-2006	Malaysia	It is valid after 1985.
Liu et al. (2008)	1947-2002	USA	It is valid in the multiplied spending on the other hand in the total spending Keynes in valid.
Samudram & Nair (2008)	1970-2004	Malaysia	Double directed causality for health spending; it is valid in the long run for the other spending.
Kalam & Aziz (2009)	1976-2007	Bangladesh	It is valid in both long and short run.
Dolenc (2009)	1992-2007	Slovenia	Hypothesis is valid.
Roy (2009)	1950-1998	USA	Governmental spending has negative effects on the growth.

Author(s)	Period	Country(s)	Conclusion
Lamartina & Zaghini (2010)	1970-2006	23 OECD	There is more powerful relationship in the developing countries; It is also valid for the developed countries however the rate is lower than for the developing countries.
Montiel (2010)	1950-1999	Mexico	There is Granger causality. It is valid.
Durevall & Henrekson (2011)	1860-1970	Swedish and UK	The Law is not valid in the long run.
Zheng et al. (2010)	1952-2007	China	There is not any powerful proof.
Zaman et al. (2011)	1960-2009	Pakistan	There is no relationship between spending for agriculture and the growth in the long run.
Brückner et al. (2012)	1960-2007	43 World Country	Hypothesis is valid although the parameters are different for rich and poor countries.
Narayan et al. (2012)	1986-2009	Indian States	The Law is valid however, only capital spending supports the growth.
Magazzino (2012)	1960-2008	Italy	There is Granger causality.
Kumar et al. (2012)	1960-2007	New Zealand	Granger causality is valid for the long run.
Wu & Lin (2012)	1998-2006	China	Hypothesis is not valid.
Ijeoma et al. (2012)	1970-2010	Nigeria	Hypothesis is valid.
Gurgul et al. (2012)	2000-2008	Poland	There is causality but it is valid in the opposite direction.
Akinlo et al (2013)	1961-2009	Nigeria	It is valid as also associated with the population.
Kirchner (2013)	1901-2009	Australia	It is valid in the long run and no valid in the short run.
Bashirli & Sabiroglu (2013)	2001-2010	Oil-exporting countries	There is causality in both long and short run.
Grenade & Wright (2013)	1980-2011	Caribbean Countries	It is valid because of political effects.
Sakyi (2013)	1980-2008	West African Countries	Hypothesis is valid

Goldman Sachs has used the abbreviation of BRIC (Brazil, Russia, India, and China) for the first time to mean "rapid developing economies" in 2001 (Singh, 2013). After the regional economic cooperation organization begin to increase in last 40 years, in the final period, BRIC economies became the main topic as structuring beyond the regional samples in 2006. These economies have partially become official with the meeting that was made by foreign affairs ministers of the 4 national rapid developing economies. Brazil, Russia, India and China leaders have reached a consensus for meeting once a year in order to discuss economical and political issues. So, some kind of unity that has formed with the initials (BRIC) of these 4 countries. In 2011, when South Africa was invited to the third meeting in

China, the group had a new addition and have been called BRICS ever since. In 2006, from the first meeting at a level of Foreign affairs ministers to the present meetings were made about foreign affairs, finance and economy, trade, agriculture, and health. The meetings have continued about science, technology, trade rivalry and national security. In 2011, in the third meeting, it reached a consensus about playing a central role for the world economy (Schmalz & Ebenau, 2012). It expanded visions that BRICS economies probably will be the biggest economies of the world in by 2030 (Khan, 2011; Yao & Liu, 2011).

Some abbreviations are generated for the rapid developing economies except BRICS. For example, the abbreviations such as Mexico, Argentina, Nigeria and Turkey (MANT); Poland, Indonesia, Korea and South Africa (PIKS); BRIC+Argentina (BRIC-A) are in question (Aggarwal, 2013; Aktan et al., 2009). I use (MATIK) abbreviation for Mexico, Argentina, Turkey, Indonesia and Korea in this study, and while I do my analysis through BRICS, I also do it for MATIK. Moreover, I include (BRICS+MATIK) into the analysis by combining these two rapidly developing country groups that generate a great majority of the world's population and economy. In addition, I include BRICS+MATIK economies into the analysis by comparing them with the world and the G-7 economies. According to January data of 2014, while world population is 7.145 billion, G-7 countries are 747.914 million; BRICS+MATIK countries population is 3.512.958 million. Proportionately, BRICS+MATIK generate 49,16% of world population, and G-7 countries generate 10,46% of world population.

Public sector is very big economical category and it is consisted of a big range from state-owned enterprises (SOE) to public revenue and spending, fiscal or monetary policy. Each of the variables in this range has different effects on the growth. Public spending is one of the most effective functions of the public sector and different effects can exist depending on the spending qualifications.

There exist empirical findings about structural and R&D based spending affects positively the growth processes while there are also some studies that depict the fact that social security spending has negative effects over the growth processes. The total population of BM countries as fast developing countries consist 49,16% of the world population and 26,46% of the world economy. BM economies which had 4,25% average growth rate (BRICS 3,7%; MATIK 4,8%) based on the period of 1962-2012 and they consist 26,46% of the world economy through 2013. The growth rate of world economies was 3,45% through the period of 1962-2012; OECD countries' average growth rate was 3,13% and G-7 countries average growth rate was 2,9 (Kargi, 2014). It is obvious that BM countries have a very big growth rate as comparing to other categories. Therefore, it is worth to examine the relationship between this big growth rate and public spending in BM economies as such a big economic category. There are many components which support BM countries this growth rate. An interesting research subject is whether public sector support and encourage this growth processes as one of those components or not.

In short, UN country groups are fast developing economies and their growth processes should be examined through many aspects. They are also very convenient country groups to investigate the relationship between the growth and public spending which have been discussed through economy literature.

2. Data and Methodology

The growth and public spending data which belong to BM countries are obtained from UNCD and these are for the period of 1980-2012 (for Russia 1989-2013). The growth rate (g) depicts GDP increase. The variable of total public spending (s) is the rate of countries' public spending to GDP. Therefore, the direction and the degree of the relationship between public spending and the growth could be tested. Seasonal tests were not needed due to the fact that series are annual data.

The main hypothesis which is tested through the study is "there is causality from economic growth to public spending." This causality relationship could have the directions as Keynes and Wagner assumed. This study focus on the direction of the relationship between the growth and public spending, moreover the long term based relationship between the variables are tested. Accordingly, the secondary hypothesis is "economic growth and public spending is co-integrated in the long run.". Granger causality test (1969) is used for testing the first hypothesis. Dickey-Fuller (1979); Phillips-Perron (1988) and KPSS (1992) unit root tests are used to verify the condition of that series must be constant for Granger causality. (The error correction model is also applied to sustain the short term balance and to eliminate data loss which is happened because the first differences are taken in case of that the series are not constant in their level values.) Engle-Granger (1987) two phased co-integration test is applied to test the second hypothesis.

3. Empirical Analysis and Results

The results related to three different unit root tests which are done in order to test whether the series are constant or not are shown in *Table 2*. The columns in *Table 2*, which are shown as "Δ", are the test results which are obtained when the first differences of the series are taken.

The series are not constant according to each of three tests results so that their first differences are taken to set them constant. When comparing the critic values which are shown inside of the brackets with the test statistics under the column which is depicted byΔ" symbol in *Table 2*, they verify the series become constant as taking the first differences.

Table 2. ADF, PP and KPSS Unit Root Tests (No Intercept and Trend)

	ADF	ADF∆	PP	PP∆	KPSS	KPSS∆
	-1.965735	-10.80296	-2.818729	-14.51167	0.444875	0.191034
Brazil	(-2.611094)	(-2.611094)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	0.426030	-8.518785	0.433711	-8.494389	0.676525	0.380891
	(-2.610192)	(-2.611094)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	-2.186479	-6.709351	-2.186479	-7.228242	0.398784	0.140323
Russia	(-2.669359)	(-2.674290)	(-2.669359)	(-2.674290)	(0.739000)	(0.739000)
	-0.342274	-5.817922	-0.248306	-7.277827	0.103066	0.500000
	(-2.664853)	(-2.674290)	(-2.664853)	(-2.669359)	(0.739000)	(0.739000)
	-0.960811	-9.436515	-2.308628	-29.90033	0.835311	0.036225
India	(-2.612033)	(-2.612033)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	0.952678	-6.162140	0.922685	-6.282721	0.764507	0.164603
	(-2.610192)	(-2.612033)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	-1.623503	-8.512389	-2.676276	-9.127530	0.503965	0.275366
China	(-2.612033)	(-2.611094)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	-0.296800	-2.939981	-0.292489	-8.408039	0.422569	0.095488
	(-2.610192)	(-2.617364)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	-2.427359	-7.430080	-2.097226	-20.20259	0.390915	0.500000
S. Africa	(-2.610192)	(-2.612033)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	1.958645	-5.900289	2.371291	-5.856699	0.913332	0.153946
	(-2.610192)	(-2.611094)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	-2.965035	-7.662459	-2.797686	-27.83502	0.636322	0.433913
Mexico	(-2.610192)	(-2.612033)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	0.897964	-6.332757	0.712010	-6.404030	0.708392	0.088749
	(-2.610192)	(-2.611094)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	-5.007378	-8.851651	-5.032982	-33.23015	0.100000	0.467940
Argentina	(-2.610192)	(-2.612033)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	-0.201195	-8.446579	0.325031	-8.882743	0.220561	0.180513
	(-2.610192)	(-2.611094)	(-2.910192)	(-2.611094)	(0.739000)	(0.739000)
	-2.332681	-8.629630	-3.805554	-25.51235	0.109445	0.084257
Turkey	(-2.611094)	(-2.612033)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	0.783708	-7.096444	0.715281	-7.117852	0.540079	0.085468
	(-2.610192)	(-2.611094)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	-2.356792	-7.925829	-2.356792	-19.96889	0.118233	0.233555
Indonesia	(2.610192)	(-2.612033)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	-0.731719	-12.28126	-0.697999	-13.12983	0.132241	0.112215
	(-2.610192)	(-2.611094)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	-0.682819	-6.598312	-1.652125	-22.62237	0.642071	0175838
Korea Rep.	(-2.614029)	(-2.614029)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)
	-0.393107	-7.014346	-0.364457	-7.032467	0.579199	0.181389
	(-2.610192)	(-2.611094)	(-2.610192)	(-2.611094)	(0.739000)	(0.739000)

Note: For each country, the values in the upper lines belong to (g) variable and italic values in the lower lines belong to (s) variable. The values inside the brackets are test critical values with 1% significance level.

The series, which became constant from the same degree, are applied to long term co-integration test for each country. The results of Engle-Granger test which is used for this are shown in *Table 3*. The parameters and t-statistics which belong to regression equations that are

built among the (g) and (s) variables for each country are illustrated in the table. The error term (u) which are obtained from the regressions are applied to unit root tests (ADF and PP) again. The condition of that error terms must be constant is matched. This result is obtained when the test statistics which are obtained for error terms are compared the critical values which are shown inside the brackets.

Table 3. Engle - Granger Co-integration Test

Equation	Coefficient	t-Stat.	u → ADF	u → PP
Brazil	-0.347847	-0.755665	-10.78238 (-3.565430)	-14.23231 (-3.565430)
Russia	-0.205576	-0.349285	-6.729700 (-3.769597)	-7.508552 (-3.769597)
India	-2.487205	-2.137474	-6.307663 (-3.574446)	-21.36689 (-3.565430)
China	2.282701	1.583141	-7.761992 (-3.565430)	-8.040614 (-3.565430)
S. Africa	-1.188256	-2.568981	-7.760996 (-3.268308)	-37.72546 (-3.565430)
Mexico	-0.501953	-0.562508	-7.750828 (-3.568308)	-24.06932 (-3.565430)
Argentina	-1.163592	-2.597371	-9.743392 (-3.565430)	-18.59121 (-3.565430)
Turkey	-0.031531	-1.579511	-6.856248 (-3.565430)	-6.859222 (-3.565430)
Indonesia	0.776320	1.547725	-8.061431 (-3.568308)	-31.66495 (-3.565430)
Korea Rep.	-1.338549	-2.493665	-6.577396 (-3.574446)	-31.70071 (-3.565430)

Note: The values in brackets and under the coefficients are Standard Deviation Values. The values in brackets and under ADF, PP and KPSS test statistics are the critical values for 5% significance level.

Table 4 tests the causality relationship between (g) and (s) variables. Granger causality test results are done through 5% significance level and 2 delay. Ho hypothesis is "the variable of (s) is not Granger reason of the variable of (g)". The alternative hypothesis is as Wagner brought forward "(s) is the reason of (g)".

Table 4. Granger Causality Test

	Hypotheses	Chi-sq	Prob.	Result
Brazil	Wagner	0.560312	0.7557	(s) is not the reason of (g).
	Keynes	1.379583	0.5017	(g) is not the reason of (s).
Russia	Wagner	4.243775	0.1198	(s) is not the reason of (g).
	Keynes	1.132042	0.5678	(g) is not the reason of (s).
India	Wagner	0.061012	0.9700	(s) is not the reason of (g).
	Keynes	2.883540	0.2365	(g) is not the reason of (s).
China	Wagner	4.421365	0.1096	(s) is not the reason of (g).
	Keynes	2.369751	0.3058	(g) is not the reason of (s).
S. Africa	Wagner	6.852868	0.0325	(s) is the reason of (g).
	Keynes	0.539072	0.7637	(g) is not the reason of (s).
Mexico	Wagner	2.489833	0.2880	(s) is not the reason of (g).
	Keynes	0.274476	0.8718	(g) is not the reason of (s).
Argentina	Wagner	1.548467	0.4611	(s) is not the reason of (g).
	Keynes	10.44791	0.0054	(g) is the reason of (s).
Turkey	Wagner	8.500288	0.0143	(s) is the reason of (g).
	Keynes	0.240998	0.8865	(g) is not the reason of (s).
Indonesia	Wagner	0.458962	0.7949	(s) is not the reason of (g).
	Keynes	2.826529	0.2433	(g) is not the reason of (s).
Korea Rep.	Wagner	1.482568	0.4765	(s) is not the reason of (g).
	Keynes	7.593163	0.0224	(g) is the reason of (s).

Note: *For Wagner, Ho: (s) is not the Granger reason of (g). H1: (s) is the Granger reason of (g). Ho is declined for prob. < 0.05. Ho is accepted when prob. >0.05. For Keynes, Ho: (g) is not the Granger reason of (s). H1: (g) is the Granger reason of (s). Ho is declined for prob. <0.05. Ho is accepted when prob. > 0.05.*

Whether there is causality from (g) to (s) is also tested in *Table 4*. The hypothesis that Keynes claimed as "(g) is the reason of (s)." is the H1 hypothesis. Therefore tested Ho hypothesis is "the variable of (g) is not the reason of the variable of (s)".

4. Conclusions

BM countries are growing fast. However, except China and Korea they are not the countries which can have high capital amounts. Therefore BM countries are vulnerable to external shocks. At the same time, public sector's effects over country economies are dominant. Political processes can affect the economy conjecture intensely. BM countries' growth performance and public spending are co-integrated in the long run depend on the long term

tests that are shown in this study. Therefore, there is co-integration between (g) and (s) in the long run for all BM countries according to the results of *Table 3*.

However, Wagner Hypothesis is not valid for many of BM countries according to 1961-2013 data. There is causality for only South Africa, Argentina and Turkey in the long run when Table-4 is analyzed. Through these causalities, Wagner's Rule is applicable for South Africa and Turkey while Keynes's hypothesis is valid for Argentina. This result will require the examination in terms of qualitative aspects of economic growth in addition to its quantitative aspects.

As a result of this condition, it could be said that public spending is not efficient spending that support the economy. Causality between public spending and the growth is not found although economic growth is achieved through inefficient spending. On the other hand, a more widely research should be conducted about public spending types in order to determine the public spending which support economic growth in the long run.

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EMPIRICAL ANALYSIS OF HUNGARIAN FIRMS ACCORDING TO VENTURE CAPITAL INVESTMENT CRITERIA

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Over the past decade the venture capital industry has become more and more prominent, not just on a global level, but in Hungary, too. Thanks to the JEREMIE Program a large number of new venture capital firms are located in our country, and therefore an investment wave has started. The aim of the paper is to sort micro- and small sized enterprises in terms of how appropriate is a venture capital financing. The main topic of the paper relates to the selection of firms for venture capital investment; therefore, in the first part of the study we briefly summarize a general venture capital investment process, highlighting both the selection process and the criteria used for selection. Then we propose 3 indexes (trustworthiness index, openness index, investment index), which we have created to help venture capitalists to decide whether the targeted enterprises are appropriate for them, or not. In the main part of the paper we provide a classification of micro- and small sized Hungarian firms based on my own survey, and we analyze what kind of relationship exists between the proposed indexes and the type of the classified firms. The result of the classification is that we identify four main firm types and, based on statistical tests, it can be said that there is no significant relationship between the trustworthiness index and the clusters, but that there are between the two other indexes and the clusters.

Keywords: **venture capital, institutional investors, firms, selection criteria, cluster analysis.**

JEL Classification: **G24, G23, M1.**

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1. Introduction

Over the past decade the venture capital industry has become more and more prominent, not just on a global level but in Hungary, too. Nevertheless, enormous variations remain in the size and success of venture capital markets around the world. (Cumming, Schmidt & Walz 2010)

Venture capital has had a prominent role in the Hungarian economy over the past 5-6 years, although it made its first appearance in the regime change of 1989 (Karsai, 2006). Most venture capital funds were foreign, because the appropriate legal and economic environment did not then exist in Hungary. The first relevant law came into force in 1998, but this did not encourage investors (Banyár & Csáki, 2006); since then, continuous improvements have been made. The path of Hungarian VC development has been affected by a number of factors, such as the underdeveloped financial system, the quality of enterprises, culture, institutions, history and public engagement (Karsai, 2012).

In a Central and Eastern European context the Hungarian venture capital industry was outstanding between 2004 and 2008, but as a result of the financial crisis it encountered serious problems. After 2007, when the financial crisis occurred, the Hungarian venture capital industry started to slow down. The reasons for the decline were, on the demand side, the intensifying competition for venture capital funds between entrepreneurs. Since the financial crisis, it has been hard to get loans from banks, and therefore the owners of companies have started to look for alternative sources of funds, such as venture capital. On the other hand, the sources of venture capital also decreased because the VC funds held back on releasing funds in order to stabilise their own portfolios, and so the founders of VC funds also affected the crisis because of the reduction of the amount of funds managed (Karsai, 2013).

The impact of the financial crisis can be observed in the decrease in the share of the private equity segment. However, the classic venture capital segment has now started to increase, due to the JEREMIE Program. (MNB, 2015) The above mentioned problem, i.e. the lack of capital, has been solved thanks to the European Union and the Hungarian government. Together they created the JEREMIE Programme, which offers 45 billion HUF (around 150 million euros) for 8 VC funds. The goal of the new 8 VC funds is to finance the innovative, micro- and small-size enterprises that previously disappeared beyond the horizons of both investors and the government (Karsai, 2013).

All of this sounds encouraging, but the questions remains as to whether there are sufficient enterprises of the right quality to be financed by venture capital funds. Many in the business community have written about this problem, highlighting the role of the growing

allocated capital but expressing scepticism about whether VC funds can find the right portfolio companies. According to investors, a mistaken classification of Hungarian enterprises is caused by incompetent management and the lack of sales activity. The consequences of the situation described above are that, on the one hand, any business - even those less suitable - can get access to capital, and, on the other hand, the investment period is extended with the JEREMIE funds (MNB, 2015).

In the introduction we gave a very brief review of the Hungarian venture capital industry as a basis for this study. Due to the current situation in Hungary, it is important to understand the main characteristics of Hungarian enterprises, in order to know whether they meet the expectations of venture capital funds. The purpose of the study is to provide a classification of micro- and small sized Hungarian firms, based on my own survey and to analyze what kind of relationship exists between the proposed indexes and the types of the classified firms.

Firstly, we give a general overview of the selection phase of the venture capital investment process, because this theoretical background will be used for the analysis of the survey. Secondly, for a deeper understanding we briefly describe 3 indexes, which we created to help venture capitalists to easily decide whether the targeted enterprises are appropriate for them, or not. In the last part of the paper we present and discuss the empirical results of cluster analysis and we finish with a conclusion.

2. Literature Review

After the introduction, where we briefly characterize the Hungarian venture capital industry, let us continue the literature review of the main topic of the paper.

The purpose of this section is to describe the usual process of deal-making in a venture capital firm and a few of the decision making characteristics of the deal. More important here is the kind of criteria used by venture capitalists to evaluate new venture proposals. Based on Kollmann and Kuckertz (2009); Macmillan, Siegel, and Narasimha (1985); Tyebjee and Bruno (1984); Hall and Hofer (1993); Khanin, Baum, Mahto, and Heller (2008); Fried and Hisrich (1994) we give a list of the general criteria that venture capitalists use to evaluate potential investments. These criteria are, for example, the entrepreneur's personality, ability, experience; the characteristics of the business; the character of the product/ service; the business model; competition and market growth; and of course the financial system development level. The criteria for the ranking of each investor is different, but uniform agreement can be observed in this regard that the most important aspect of the investor is the entrepreneur skills, fairness and experience. These are very subjective factors, but venture capitalists always co-operate with someone in whom they see the

proper sympathy. In addition, another important criteria is the possibility of the exit because without a good exit the venture capitalist cannot raise new fund in the next term.

The venture capital investment process consists of 5 steps. These are deal origination, deal screening, deal evaluation, deal structuring and post-investment activity (Tyebjee & Bruno, 1984). The theory of selection is well developed in finance; it will not be reviewed here. However, we emphasise the screening and evaluation phases, where the venture capitalists or their team seek to subjectively assess the potential enterprises on a multidimensional set of criteria. Tyebjee and Bruno (1984) find 5 dimensions, namely, market attractiveness, product differentiation, managerial capabilities, environmental threat resistance, and cash-out potential. From these dimensions it is necessary to highlight the venture's ability to manage them effectively, the quality of the management team, and the product's competitive advantages and uniqueness.

Other authors (Kollmann & Kuckertz (2009); Macmillan et al. (1985); Hall and Hofer (1993); Khanin et al. (2008); Fried and Hisrich (1994)) have also written about this topic. The differences in their approach concern the type of research methods used, the sample, and how they categorize the criteria. Most of them define the following criteria: venture capital firm/fund requirements, the characteristics of the entrepreneur, the nature of the proposed business, and the economic environment of the proposed industry or country.

Zacharakis and Meyer (1998) criticize the above mentioned studies because the majority of past research relies on post hoc methodologies to understand the decision process and criteria. Zacharakis and Meyer (1998) use policy capturing and a real-time method common in cognitive psychology. Their findings suggest that venture capitalists are not good at introspecting about their own decision processes because, as more information becomes available, insight diminishes.

In order to collect the right variables for the cluster analysis we have to know what the most useful criteria in the venture screening process are. Therefore, we highlight three aspects which are used during the analysis. We think that the most important are the entrepreneur's reliability and openness; the financial methods of and the character of the product/service.

In the next section we introduce our own sample and the variables and describe the 3 indexes we have created for analysis.

3. Data and methodology

In this section we introduce the sample, the variables and the indexes. We use a representative survey which was provided by the HÉTFA Research Institute, which consists of 300 Hungarian micro- and small-size enterprises. The survey was made at 2011 spring. The enterprises in the survey were involved in the industrial, trading and service sectors, operating in seven different regions of Hungary. The business owners were interviewed. The purposes of the survey were to understand how micro- and small-size enterprises operate on an everyday basis, and what their development plans are. (Survey, 2011)

As regards the analysis, we consider it problematic that we only use this particularly survey and its data; however, we were not involved in the editing of the survey. We added extra information to the database, such as sales, total assets, and ownership structure. In *Table 1* we list all the variables we use for the analysis. *Table 1* contains basic statistical information, such as the mean, std. deviation, minimum and maximum value of all variables. Some of the variables are dummies, but there are others which are measured in scales. In these cases we standardize these to get nominal variables whose value is between 0-1. For example, we note that the maximum value of the sales variable is 2,900,000,000 HUF; we then divide the amount of each company's sales by that maximum value. We apply the same method for the years of operation, entrepreneurs' years of activity, the age of the interviewees, the income level of the interviewees, sales, total assets, the trustworthiness index, the investment index, and the openness index.

After introducing the database we summarise the structure of the indexes we mentioned earlier, because we will use them later on. In Futó – Szobonya (2012) we created 3 indexes which might be taken into account as selection criteria for venture capitalists. The first is the *trustworthiness index*, which gives information about the reliability of the manager. The second index is the *openness index*; this measures how enterprises agree to take venture capital investment which involves their own company. The third index is the *investment index,* which characterizes the company's investment objectives.

The creation of the proposed indexes started from the questions of the survey given to us. The survey consisted of 86 questions, despite the difficulties, which mentioned earlier, 16 questions could be selected to build the indexes. Thus, we began to introduce the creation of the proposed indexes. We received some help to the selection of appropriate questions from Peter Szobonya, who has taken part in several venture capital negotiation as an intermediary party, therefore he has some knowledge about the habits of and expectations of the venture capitalist. During forming the index values we used Microsoft Office Excel.

Table 1. Descriptive statistics of the variables

	Minimum	Maximum	Mean	Std. Deviation	Number of respondents
Budapest	0.0000	1.0000	0.3367	0.4734	101
Debrecen	0.0000	1.0000	0.1633	0.3703	49
Dunaujvaros	0.0000	1.0000	0.0833	0.2768	25
Miskolc	0.0000	1.0000	0.1233	0.3294	37
Szeged	0.0000	1.0000	0.1200	0.3255	36
Szekszard	0.0000	1.0000	0.0567	0.2316	17
Zalaegerszeg	0.0000	1.0000	0.1167	0.3216	35
micro-size enterprise	0.0000	1.0000	0.4767	0.5003	143
small-size enterprise	0.0000	1.0000	0.5233	0.5003	157
industrial company	0.0000	1.0000	0.2933	0.4561	88
trading company	0.0000	1.0000	0.3167	0.4660	95
service company	0.0000	1.0000	0.3900	0.4886	117
the interviewee is the owner	0.0000	1.0000	0.8288	0.3774	242
the interviewee is not the owner	0.0000	1.0000	0.1712	0.3774	50
the owner is an active worker	0.0000	1.0000	0.9267	0.2611	278
the owner is not an active worker	0.0000	1.0000	0.0733	0.2611	22
vocational education	0.0000	1.0000	0.0367	0.1883	11
educated to high school level	0.0000	1.0000	0.3233	0.4685	97
graduate	0.0000	1.0000	0.6400	0.4808	192
married	0.0000	1.0000	0.8712	0.3356	257
unmarried	0.0000	1.0000	0.1288	0.3356	38
religious	0.0000	1.0000	0.6056	0.4896	172
non-religious	0.0000	1.0000	0.3944	0.4896	112
has children	0.0000	1.0000	0.9033	0.2960	271
has no children	0.0000	1.0000	0.0967	0.2960	29
male	0.0000	1.0000	0.7200	0.4497	216
female	0.0000	1.0000	0.2800	0.4497	84
member of a business organization	0.0000	1.0000	0.6133	0.4878	184
not a member of a business organization	0.0000	1.0000	0.3867	0.4878	116
poor	0.0000	1.0000	0.0517	0.2219	15
average income	0.0000	1.0000	0.8379	0.3692	243
rich	0.0000	1.0000	0.1103	0.3139	32
the owners is Hungarian	0.0000	1.0000	0.9800	0.1402	294
the owner is foreign	0.0000	1.0000	0.0200	0.1402	6
operation years_standardized	0.0800	0.9200	0.5286	0.2566	
entrepreneurs years_standardized	0.0476	1.0000	0.6988	0.2984	
age of the interviewee_standardized	0.2500	0.9750	0.6500	0.1300	
income level of the interviewee_standardized	0.0000	1.0000	0.5633	0.1711	
sales_standardized	0.0001	0.9861	0.0688	0.1191	
total assets_standardized	0.0001	0.9892	0.0589	0.1176	

Source: *Authors' calculations*

The trustworthiness index consists of 4 questions and each refers to how the owner-manager considers certain irregularities to be acceptable, such as tax fraud or kickbacks. The truths of statements are marked from 1 to 10 scale. A value of 1 means "never allowed", while 10 is "always permissible". The final value of the index is a weighted average of the 4 answers to that, so the value of the trustworthiness index are between [1-10]. If the value of the index is 1, then we say that the owner of the company is reliable, and higher value from 1 means the owner is unreliable.

Connected to the openness index, 10 questions were considered appropriate to evaluate the openness, so there are types of questions we put as "I could not bear that the company falls into the hands of another, not even if I get good price for it" or "I could not bear to an external financial investor as a co-owner interfere in the management of the company" or "for the company's growth use of venture capital is conceivable". The openness index is composed of 10 different questions, which were needed to scale firstly, and then the answers were classified so that they strengthen or weaken or neutralize the openness index. If the answer to a question strengthened the openness index we give a 1, if it weakened -1 and 0 if neutral. Then we summarized the value of the answers to the questions that are weighted equally in the index. The possibility of variation in the openness index moves in quite a wide range. The most ideal case, the maximum index value is 8 and the minimum is -7.

Finally, the investment index is related to the company's future investment plans and financing issues. In the case of the investment index, three categories were distinguished during the forming: "absolutely inappropriate", "medium" and " highly relevant". The "absolutely inappropriate" category is relevant to a company that does not plan to expand or invest by venture capital. The "medium" rating is given to companies that plan to research and development and / or new services, new product introduction and / or expansion of equipment, but in the first round do not intend to finance these plans by involvement of an external investor. Those companies which plan to the above listed investments and financed by external investors are in the "highly relevant" category. In later it would be difficult to carry out an analysis with group names, thus we simply added values to each groups, but it is irrelevant what the number of the value is. The highly relevant group received 1, the medium got 2, and absolutely inappropriate group got 3.

For the best investment opportunity; therefore, you must search for the following criteria: the trustworthiness index should be 1, the openness index should be positive and the investment index should be 1.

In the study (Futó – Szobonya 2012) we made a regression analysis in SPSS to find out which variables the success of a venture capital investment depends on. The explanatory

power of regression models was not considered appropriate, and thus I do not wish to present the results here again; consequently, we continue with the cluster analysis.

The purpose of the clustering is to identify different groups in order to characterize the typical company which could meet the requirements of venture capitalists. Firstly, we form the clusters; then we briefly summarize the best-fitting traits. After this, we conduct a relationship analysis with the explanatory variables, the missing variables and the 3 indexes. For all these we make a K-mean cluster analysis in the SPSS program.

The process of the analysis involves all the variables available to me selected for the clustering; we tested how they contribute to cluster formation. We start with the standardization of the explanatory variables and remove the atypical cases (outliers) which would distort the clustering. The dendrogram can provide a starting point to determine the number of clusters. In this case, we have a sample with 300 elements; it is hard to read the exact number of clusters from the dendrogram, but the conclusion is that the correct number of clusters is 4 or 5. We carry out some random K-mean clustering in various cluster cases, and then we choose 4 as the number of the cluster. In making the decision it is important that there is a good distance between the cluster centres, so that they will be interpreted accurately. If 6 or 8 clusters are formed, the expected results will be lost from the analysis.

To find the final explanatory variables we need to use One-way ANOVA, which provides a statistical test of whether or not the means of several groups are equal, and therefore generalizes the *t*-test to more than two groups. As a starting point we use all the variables to form 4 clusters, and we analyse the ANOVA table (in *Table 2*) to find the best variables which contribute significantly to cluster formation and those which can be disregarded.

We have to consider those variables which have a significant level of zero and also those between 1 and 5 per cent, such as the structure of the ownership, the income level of the interviewed, and total assets. Completely insignificant variables include married, religious, the entrepreneurs' age, and the age of the interviewee. The signification level of the years of operation variable is above 5 per cent, but in the descriptive table it can be seen that the missing validity is the highest here, and therefore we lose one third of my sample during the clustering. To find the best clusters we omit a few explanatory variables such as the married, religious, children, male, poor and average income variables, the entrepreneurs' age, and the age of the interviewee.

Table 2. ANOVA output of the explanatory variables

	F	Sig.
Budapest	72.04664	0.00000
Debrecen	2.51597	0.05941
Dunaujvaros	2.40790	0.06830
Miskolc	5.74449	0.00086
Szeged	7.19590	0.00013
Szekszard	4.85193	0.00278
micro-size enterprise	6.22926	0.00046
industrial company	93.07387	0.00000
trading company	7.80426	0.00006
the interviewee is the owner	4.87335	0.00271
the owner is an active worker	5.20694	0.00174
educated to high school level	608.08470	0.00000
graduate	1061.17825	0.00000
married	**0.73782**	**0.53060**
religious	**0.46087**	**0.70992**
has children	**1.05956**	**0.36735**
male	**1.53146**	**0.20750**
member of a business organization	9.51449	0.00001
poor	**1.62141**	**0.18557**
average income	**1.23437**	**0.29831**
the owners is Hungarian	4.54388	0.00417
operation years_standardized	2.32203	0.07629
entrepreneurs years_standardized	**0.65810**	**0.57874**
age of the interviewee_standardized	**0.62937**	**0.59683**
income level of the interviewee_standardized	3.29161	0.02163
sales_standardized	4.18256	0.00671
total assets_standardized	3.32937	0.02059

Source: *Authors' calculations*

4. Empirical Results

To explain the clusters we use the output of the final cluster centres and the ANOVA output, which can be found in *Table 3* and *Table 4*.

Based on the geographic variables, 4 clusters are formed. Two out of the four are mixed groups, which means the enterprises operate in any part of the country. In the third cluster there are only Budapest based enterprises, and in the fourth cluster there are only enterprises in rural areas. For this reason we have named the third cluster Budapest-only businesses, while the

fourth cluster is called the rural businesses group. If we wish to distinguish between the first and second clusters, it can be said that in the second cluster there is a slightly higher proportion (60%) of enterprises operating in towns in Western Hungary. So this becomes the group of businesses in western towns. Last but not least, the first cluster - where there are companies from each region – is called the mixed enterprises group.

Table 3. The main features of the final cluster centres

	1	2	3	4
Budapest	0.3182	0.2979	1.0000	0.0000
Debrecen	0.1818	0.1915	0.0000	0.1980
Dunaujvaros	0.1364	0.1064	0.0000	0.0990
Miskolc	0.1136	0.1064	0.0000	0.2277
Szeged	0.0909	0.0638	0.0000	0.2475
Szekszard	0.0455	0.0638	0.0000	0.0891
micro-size enterprise	0.7045	0.4255	0.4074	0.4059
industrial company	0.0000	0.6170	0.2037	0.3168
trading company	0.7273	0.0000	0.3704	0.2673
the interviewee is the owner	0.9091	0.8936	0.6481	0.8911
the owner is an active worker	0.9773	0.9787	0.8148	0.9703
educated to high school level	0.8864	0.8936	0.0000	0.0000
graduate	0.0000	0.0000	1.0000	0.9901
member of a business organization	0.2955	0.5319	0.6667	0.7525
the owner is Hungarian	1.0000	1.0000	0.9259	0.9901
operation years_standardized	0.4736	0.5174	0.5230	0.5739
income level of the interviewee_standardized	0.5455	0.5021	0.5981	0.5792
sales_standardized	0.0573	0.0319	0.1248	0.0654
total assets_standardized	0.0290	0.0268	0.0974	0.0660

***Source**: Authors' calculations*

In this section we characterize these four clusters with the help of explanatory variables. It must be mentioned that the function of the enterprises (such as industrial, trading and services) is not significant according to ANOVA, due to the stratified sampling, which means there is not a great difference between the groups in terms of these variables.

We identify only the main characteristics of each group. The feature of the first cluster - the mixed enterprises group – is that 70.45% of the enterprises are micro-sized enterprises, a higher proportion than in the other clusters. As mentioned above, the industry classification is not as significant as the next feature; i.e. that around 98% of the business owners are involved in the operational work of the firm. The owners of the companies are only high school graduates; around 30% are members of some type of enterprise development organization.

Furthermore, the owners of the enterprises are wholly Hungarian. Based on accounting information, the average revenue is around 166,170,000 HUF, while the average total assets are 72,500,000 HUF.

Table 4. ANOVA output of the classification

	F	Sig.
Budapest	146.9319	0.0000
Debrecen	4.2500	0.0060
Dunaujvaros	2.3669	0.0715
Miskolc	5.7814	0.0008
Szeged	8.2422	0.0000
Szekszard	1.7964	0.1485
micro-size enterprise	4.3484	0.0053
industrial company	17.7850	0.0000
trading company	24.5875	0.0000
the interviewee is the owner	6.9288	0.0002
the owner is an active worker	6.6339	0.0003
educated to high school level	411.7613	0.0000
graduate	4611.6674	0.0000
member of a business organization	10.7146	0.0000
the owner is Hungarian	3.5157	0.0159
operation years_standardized	**1.7435**	**0.1587**
income level of the interviewee_standardized	3.4463	0.0174
sales_standardized	5.5286	0.0011
total assets_standardized	4.6712	0.0034

***Source**: Authors' calculations*

The second cluster is the western towns cluster. In this group, 57.45% are small-sized enterprises and, compared to other groups, most of the business owners are actively involved in their companies. Most of the owners - around 90% - have graduated from high school. The owners of the enterprises are wholly Hungarian. Compared to the other groups, this is the smallest group in terms of the number of elements, e.g. the extent of the accounting information. Average sales revenues are around 92,510,000 HUF, while total assets are 67,000,000 HUF.

Based on the accounting data the third group, namely the Budapest-only enterprises group, has the largest companies. The average sales value of the cluster centre is around 361,920,000 HUF, while the total asset value is 243,500,000 HUF. This group consists of 54 enterprises, of which 40-60% are divided between micro- and small-sized enterprises. An important difference compared to the other groups, is that 64.81% of the respondents are also the owners, and only

80% of these owners are actively involved in the daily operations of the business. This fact is related to the ownership structure, as in this group some companies have foreign owners. 100% of the managers are highly educated.

Finally, the fourth group, the rural businesses group, consists of 101 micro- and small-sized enterprises and is therefore the biggest. The total sample size is 300, of which 54 enterprises have been excluded because of the variables. It also emerges that 3% of the owners are non-active participants and some owners are foreign. In terms of educational level, almost everyone has a degree. In terms of the accounting data, these companies are in second place, and considering the values of the cluster centres, it seems the revenue is 189,660,000 HUF, while the total asset value is 165,000,000 HUF.

Following this description of the clusters we attempt to identify whether there is a difference between each cluster and the three indexes, and if so, of what kind. Therefore, we carry out an independence test and an analysis of variance. The results of these tests only summarize the level of significance (Table 5). Because we use nominal variables during the analysis, together with the test of homogeneity of variance, we also carry out an ANOVA test, and the robust test of equality of means (Welch). From the result of these tests it is clear that the trustworthiness index is not significant, so there is not a great difference between the indexes and the clusters. However, with the openness index and the investment index there is significance, according to the ANOVA test.

Table 5. ANOVA output of the classification

	Test of Homogeneity of Variances Sig.	ANOVA Between groups Sig.	Robust Test of Equality of Means (Welch) Sig.
trustworthiness index	.0260	.31219	.2632
openness index	**.2152**	**.00001**	**.0000**
investment index	**.0016**	**.02305**	**.0184**

Source: *Authors' computation*

The descriptive output (*Table 6*) also helps with the evaluation. From the assessment of the results it is clear that there is no great difference between the clusters and their means on the trustworthiness index. Apart from this, the third group is highlighted because here the average value of the trustworthiness index is 1.4265, which is the highest average value compared to the other clusters. The reliable value of the trustworthiness index is 1, and if an individual has more than one it means that the owner of the enterprise is untrustworthy. Therefore there are several owners who could be prone to fraud.

Table 6. Descriptive of the proposed indexes

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Trustworthiness index	1	43.0000	1.3314	0.8233	0.1255	1.0780	1.5848	1.0000	4.2500
	2	47.0000	1.3847	0.7564	0.1103	1.1626	1.6068	1.0000	4.3300
	3	51.0000	1.4265	0.7319	0.1025	1.2206	1.6323	1.0000	4.0000
	4	101.0000	1.2302	0.4926	0.0490	1.1329	1.3274	1.0000	3.7500
	Total	242.0000	1.3195	0.6677	0.0429	1.2350	1.4041	1.0000	4.3300
Openness index	1	44.0000	-0.6591	2.1775	0.3283	-1.3211	0.0029	-6.0000	4.0000
	2	47.0000	-0.9574	2.3587	0.3440	-1.6500	-0.2649	-6.0000	5.0000
	3	54.0000	1.2407	2.5693	0.3496	0.5395	1.9420	-6.0000	6.0000
	4	101.0000	-0.5644	2.5746	0.2562	-1.0726	-0.0561	-6.0000	5.0000
	Total	246.0000	-0.2602	2.5820	0.1646	-0.5844	0.0641	-6.0000	6.0000
Investment index	1	44.0000	2.7045	0.4615	0.0696	2.5642	2.8449	2.0000	3.0000
	2	47.0000	2.5532	0.5441	0.0794	2.3934	2.7129	1.0000	3.0000
	3	54.0000	2.3889	0.5636	0.0767	2.2351	2.5427	1.0000	3.0000
	4	101.0000	2.4851	0.5023	0.0500	2.3860	2.5843	2.0000	3.0000
	Total	246.0000	2.5163	0.5246	0.0334	2.4504	2.5821	1.0000	3.0000

***Source**: Authors' computation*

Continuing the interpretation of the relationship between the openness index and the clusters, it can be seen from the ANOVA test that the significance level of the openness index is zero, which means there is a difference between the clusters and the openness index. It is necessary to highlight the third cluster because here the mean of the openness index is the highest. It can be concluded that owners of the enterprises in the third cluster could be more open to venture capital than those in the other three clusters.

We briefly summarize the evaluation of the openness index for further analyses. The higher the value of the openness index, the more open the owner is to receiving venture capital. This means that the business owner likes or accepts a venture capitalist as a possible new co-owner. In this case, the minimum value is -6 and the maximum value is 6. In order to calculate the exact mean value of each cluster it is necessary to do the following calculation. From the descriptive table the standardized value is selected and then multiplied by six, and then twelve is subtracted from the total. Therefore, the mean value of the openness index in the third group is 1.2407, which is the highest. For the other three groups the recorded average values are negative and are less than one, which means they are in neutral position vis-a-vis VC. Entrepreneurs in the third cluster, which consists of businesses from Budapest, should be considered more open than those from the other clusters. Before the analysis we expected to find that Budapest enterprises are more open than those operating in rural towns, and the results conforms this.

The subject of the next analysis is the investment index. This has a significance level of less than 5%, so there are some differences between the groups and the investment index. The best value that an enterprise could be given is 1. For this it needs to be involved in innovative investments and to be financed by external investors, such as venture capitalists, and not by a bank. In this regard, we mention the third group also because in this cluster the investment index has the lowest average. This means that this group includes those businesses that wish to be financed by venture capitalists.

The study continues with an analysis of the missing variables. We use similar tests to ones used previously: a test of homogeneity of variances, ANOVA and Welch, and the results are given in *Table 7*.

The missing variables are married, religious, children, male, poor, average income, entrepreneurial activity in years, and the age of the interviewee, with significance levels above 10% (*Table 1*). It can be clearly seen from *Table 7* that there is no, or very little, difference between the groups and the missing variables. I only emphasize the male variable because here there is a visible difference. Consequently, no more analysis will be conducted, because it does not contribute to a better understanding.

Table 7. The results of the statistical tests of the missing variables

	Test of Homogeneity of Variances Sig.	ANOVA Between groups Sig.	Robust Test of Equality of Means (Welch) Sig.
married	.0003	.2455	.1010
religious	.1298	.3762	.3912
children	.0753	.6369	.6050
male	.0000	.0687	.0404
poor	.0057	.3753	.3787
average income	.0194	.4931	.4828
entrepreneurial activity in years	.0411	.1615	.1954
age of the interviewee	.5234	.1465	.1478

***Source**: Authors' computation*

Finally, we include a table summarizing the frequency of the indexes in each cluster (*Table 8*) because it is important to know the values for each cluster. To do this, we give a short evaluation of the indexes. If you are a venture capitalist you are looking for the best investment opportunity; therefore, you must search for the following criteria: the trustworthiness index should be 1, the openness index should be positive and the investment index should be 1.

Table 8. Frequency of each index in each cluster

	Value of the Trustworthiness index		Value of the Openness index			Value of the Investment index		
Clusters	**1**	**above 1**	**negative**	**zero**	**positive**	**1**	**2**	**3**
1	31	13	22	10	12	0	13	31
2	33	14	29	9	9	1	19	27
3	29	25	13	7	34	2	29	23
4	74	27	58	11	32	0	52	49
Missing	39	15	28	9	17	3	17	34
Sum	206	89	150	46	104	6	130	164

Source: *Authors' computation*

Only two businesses from the sample meet these criteria and both are in the third cluster. Because of data confidentiality these companies cannot be named, but we have been able to characterize them on the basis of the explanatory variables. We do not want to repeat the most important features of the third cluster before we interpret it, but the main difference between the two is the number of years of operation. One of them has been in operation for 20 years, while the other is younger.

Because the difference between the openness index and the clusters is significant, it should be mentioned that there are 58 enterprises from the fourth cluster which reject venture capitalists and there are 34 that are open to venture capital, something which cannot be explained from this analysis. Although the unique feature of the fourth cluster is that it only includes enterprises that operate in rural towns, I think that further conclusions cannot be drawn from this feature.

4. Conclusions

In the literature review we present the selection criteria and based on these we proposed three indexes in order to evaluate a potential business perspective of venture capital financing. In the international literature there are few such intention, so the forming of the indexes is filling a niche. Furthermore, we agree with the criteria set out in the literature and we consider the most important criteria is the owner / manager personality and ability.

Following the introduction of the JEREMIE Program, new venture capital has been allocated and invested over the past few years. Futó – Szobonya (2012) started to analyze which Hungarian micro- and small-size businesses were able to accommodate a potential venture capital investment.

We have modified the methodology used in their approach, and we have provided a classification of these micro- and small-size firms based on this survey. Our finding is 4 main types of firms. Two out of the four are mixed groups, which means that the enterprises operate in any part of the country. In the third cluster there are only Budapest based enterprises and in the fourth cluster there are only enterprises in rural areas. Based on the accounting information, the third cluster includes the largest companies which can be found in the sample, while the second cluster contains the smallest firms. Another important difference is that the majority of businesses who have foreign owners are in the third cluster. However, there is no great difference between the clusters in terms of the years of operation and the industrial sector. According to the sorting we could say that the third cluster‘s companies have got the best features by which may be acceptable for venture capitalist during the selection process. Because these firms operate in Budapest this gives them a competitive advantage. Budapest is the capital city in Hungary, therefore the economic environment is more inspiring so the companies have more chance to grow faster.

Subsequently, we analyzed what kind of relationship exists between the proposed indexes and the type of firm classified, because this could help to understand which firms could be potential targets for venture capital investment. The purpose of the analysis is to discover which type of company could be appropriate for venture capitalists based on the proposed indexes. Based on statistical tests, it can be established that there is no significant relationship between the trustworthiness index and the clusters, but that there is between the two other indexes and the clusters. We conclude that - based on the openness index and investment index - venture capitalists need to focus on enterprises which operate in Budapest, i.e. those corresponding to the characteristics of the third cluster. Furthermore, it can be said that only two companies out of 300 are acceptable according to the 3 proposed indexes criteria. These two firms belong to the third cluster so this also confirms that Budapest as capital city has good effect on the companies life.

Our research work does not end here, because a follow-up is necessary in order to determine how successful a venture capital selection made with the help of the proposed indexes is, and so in the future our research work will continue on this path. We plan to contact with Hungarian venture capital firms to offer our indexes to them to try it during a real investment process. Beside this we want to remake/calculate the proposed indexes for those companies, who won venture capital from Jeremie’s venture capital firms. Therefore we want to see what kind of index values have they reached, and could we classify them to our 4 groups.

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ANALYZING THE DETERMINANTS OF NON-FARM INCOME DIVERSIFICATION OF FARM HOUSEHOLDS IN PESHAWAR DISTRICT OF PAKISTAN

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The agricultural sector in Pakistan is not well-established to provide full employment opportunities and sufficient income for needed living standard to the rural population. Stagnant agricultural productivity and low returns in farming have led rural residents to look for alternative livelihoods, especially non-farm employment. With this background, the present study is an endeavor to empirically determine the factors of non-farm income diversification of rural farm households in Peshawar district of Pakistan. The study was undertaken in four villages and data was amassed from 196 small farming households by using the multi-stage sampling technique. The data were analyzed using the descriptive statistical measures, the mean of income shares approach and the ordinary least squares regression analysis. The results indicate that in all the selected villages, the pattern of non-farm employment was more or less the same; however, the income from non-farm employment activities had an important contribution towards incrementing the absolute income of farm households. Non-farm income diversification is hence crucial for sustaining livelihoods and an integral dimension for invigorating rural economies. Therefore, the study recommends the promotion of non-farm employment as a good strategy for supplementing the income of small farmers without shifting attention from agriculture.

Keywords: **Income diversification, Farm income, Non-farm income, Peshawar district, Pakistan.**

JEL Classification: **J3, R2, R23, Q1.**

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Kanwal N., Khan M.A., Zheng Z. (2016).
Analyzing the determinants of non-farm income diversification of farm households in Peshawar district of Pakistan

1. Introduction

About 70 percent of the world's very poor people are rural (IFAD, 2011). Empirical evidence from a variety of literature suggests that poor rural households engage in multiple activities and rely on diversified income portfolios. In Pakistan, poverty is also a predominantly rural phenomenon as 80 percent of the poor live in rural areas (Maqbool, 2014) and most of them depend on agriculture for their livelihoods (PES, 2013-14). However, stagnant agricultural productivity and low returns in farming have led rural residents to look for alternative or supplemental income opportunities, primarily though non-farm employment. Actually, farming as a livelihood activity is associated with immense risks (climatic, pest and diseases, price, policy etc.). This phenomenon is more severe in Pakistan where appropriate lasting mitigation solutions have yielded average results. Farm households (households who engage in the production of crops and livestock) have increasingly sought means of escaping from the detrimental consequences of poverty by inclining to diversification of their activities; within and outside the farm sector. This is to primarily address their income and food security shortfalls (Barrett & Reardon, 2000; Korir et al., 2005). Diversification therefore supports farm households to accumulate income for farm expansion engagement in non-farm businesses (Dimova & Sen, 2010; Lay & Schuler, 2008) and to solve immediate household needs (food, shelter, health care, payment of school fees etc.).

Ellis (2000) defined livelihood diversification as a process by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and improve their standard of living. Therefore, an analysis of the diversification concept has been assessed empirically from the asset, income or activity viewpoints. Asset measurement is deemed arduous and sometimes crudely estimated due to the poor development of the asset market (Barrett & Reardon, 2000). Drawing on Minot et al. (2006), Ronning & Koveried (2006), this study defines income diversification as *"a situation where farm households rely on income from multiple sources; both farm and non-farm"*. Income diversification is commonly specified in conformity with the standard practice of national accounting and macro input/output table construction where separation is made among sectorial (agriculture and non-agriculture), functional (wage and self-employment) and spatial (migration influences) classifications of diversification. In this study, we follow the classification proposed by Barrett et al. (2001) according to sectors and functions. However, spatial classification was not distinguished here because there is not a single household in the sample where income from migrated household members is relevant. All income derived is therefore classified as local. More specifically, we describe the income activities of rural farm households and examine the determinants of non-farm income diversification.

In Pakistan, rural farm households are often motivated to either participate in non-farm employment activities by pull or push factors. Households that are motivated by pull factors are those attracted by relatively higher returns from non-farm activities than the farming sector. Their decision to participate in non-farm work is principally to increase their earnings and not on the intention of risk reduction as opposed to households whose decision to diversify is due to push factors (risk aversion). This creates opportunities to choose activities that generate high returns. On the other hand, households that are motivated by push factors prioritize their survival rather than looking for better earnings. According to Reardon (1998), households who strive to manage their income and consumption uncertainties engaged in low return activities or activities that have negative correlation with farming sectors. Therefore, separately identifying the motivation behind the decision of the household to participate in non-farm employment activities is central for sound policy decision making.

The rural non-farm sector in Pakistan is a heterogeneous sector covering a wide spectrum of activities. The pursuit of this diversification leads one to explore the potentials of the whole range of non-farm activities (Ahmed, 2012). In Pakistan, non-farm employment may take all of three forms-- temporary, seasonal and permanent. The temporary employment includes; wage labor, exchange labor and part time activity, while seasonal skilled and semi-skilled jobs are carpentry, brick laying, blacksmith, employment in public and private sectors. It also includes self-employment i.e., retailers, wholesalers, rice mill owners, bus operators, and private entrepreneurs. However, permanent non-farm includes government employees, earnings from private sectors and other certain non-farm wages.

Agricultural sector in Pakistan is unfortunately not well-established to provide full employment opportunities and income sufficient for providing satisfactory living standard to the rural population. In almost all regions of the country, the poor are often marginal farmers or land-less laborers whose main source of income is usually the rural non-farm sector (Chaudhry et al., 2006). The development of various non-farm employment activities offers great potential for creating additional rural jobs and hence stimulates further economic growth of rural areas. The agricultural ministry has instead focused on farming and the industry ministry has focused on manufacturing, since little attention is given to the role and development of non-farm employment sector in the country. Non-farm sector is of great interest to developing rural economies for its productive and employment effects. Despite the recent increase in the literature on-farm/non-farm linkages, there has been no significant systematic study conducted on marginal areas in Pakistan, particularly in Khyber Pakhtunkhwa province. Most studies concentrate on dynamic agriculture, where cash crops are widely grown, while this study is to review the present situation of non-farm employment in rural areas of Peshawar district of Khyber Pakhtunkhwa province and identify major issues as well as suggesting measures for promoting rural non-farm employment activities. More specifically, this study is to assess and investigate the factors contributing to non-farm sector in Peshawar district. Results are

expected to inform government agencies, NGOs and policy makers about the development and constraints of the rural non-farm sector, its link to the farming sector and its importance for the rural development policy. It is hoped that the results of this study will serve as a useful reference for further research on the subject.

In view of the growing importance of non-farm activities in the rural economy, this study explicitly seeks to: identify the sources of income and estimate the share of farm and non-farm income in the total household income, and analyze the determinants of non-farm income diversification of farm households in the study area.

2. Methodology

2.1. Description of the study area

Peshawar district is the capital of Khyber Pakhtunkhwa province, located at the north-west end of Pakistan. The total reported area of the district is about 1,257 square km, having over 236 rural villages. The rural population is slightly higher as 1,898,478 (51.5 percent) while the urban population is about 1,787,157 (48.5 percent) (Alhasan, 2015). The rural economy of the district is agricultural based with majority of the rural households engaged in crop farming and livestock rearing along with some non-agriculture activities. The district is famous for producing both food and cash crops. The main food crops are wheat, maize and barley while the main cash crop is sugarcane. The principal fruits are plum, peach, pear, apricot, watermelon, muskmelon, apple, guava, mango, persimmon and loquat. Vegetables grown in the district are turnip, carrot, spinach, tomato, cauliflower, cabbage, peas, radish and ladyfinger (IRM, 2012). Over the last 13 years, rapid urbanization and unplanned construction have gobbled up 3,307 acres of agriculture land in district Peshawar. The total agriculture land in the district was 109,883 acres in 2001-02, which shrank to 106,576 acres in 2013-14 (Ali, 2014).

Table 1. Village-wise Land Utilization and Population

Villages	Geographical Area (Acres)	Cultivated Area (Acres)	Distance to Main Peshawar City (km)	Estimated Population	No. of registered farm families
Lala	1529	1123	9	26330	156
Jogian	1746	1064	10	30468	164
Urmar Miana	3419	2995	16	41500	648
Urmar Bala	2064	1617	17	36993	384

Source: Office of Agricultural Extension Tarnab, Peshawar, 2015

2.2. Research site

The study was undertaken in four purposively selected villages namely; Lala, Jogian, Urmar Miana and Urmar Bala of Peshawar district, considering the fact that many empirical studies have found that relative location of rural households to near town/city has significant effect on non-farm employment participation decision of households. The following figure shows the geographical and demographic features of all the four villages:

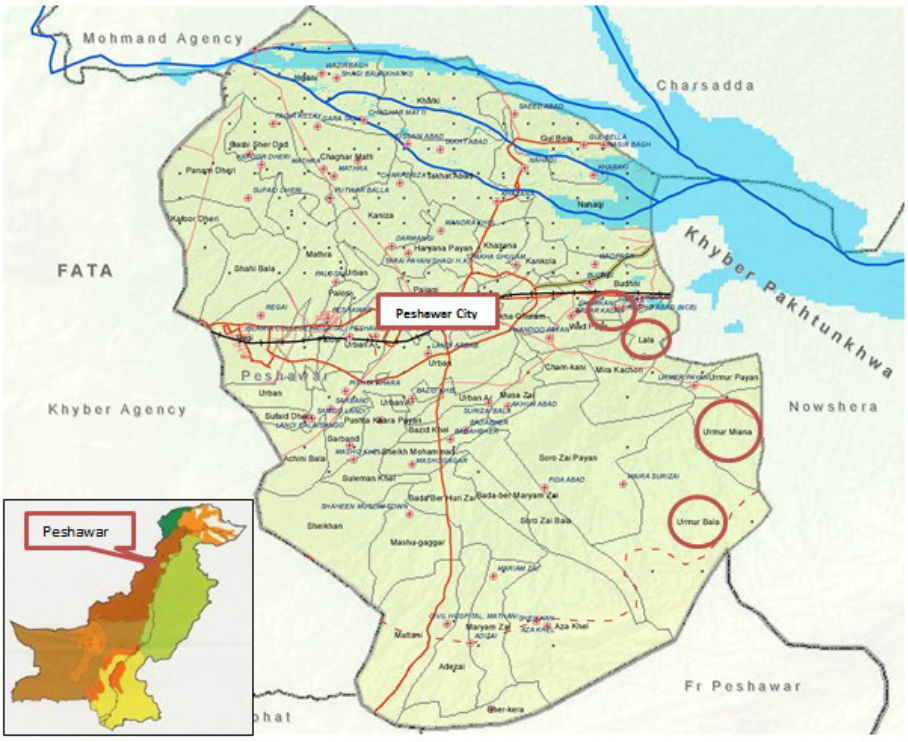


Figure 1. Map showing Peshawar district of Pakistan

Moreover, by using the comparative analysis approach, features of all the four villages (such as infra-structure, socioeconomic indicators, transport and communication facilities, and allied markets for various commodities) were compared to understand the pattern and structure of rural non-farm employment which were helpful in generalizing the results of the study

2.3.Unit of analysis and sample size

There is mounting evidence in the literature (Okali, et al., 2001; DFID, 2004; Sarah, 2012; Teshome & Edriss, 2013) that the income from household members' participation in non-farm activities contributes significantly to farm households' welfare. For the present study, the farm

household was taken as a unit of analysis and data were collected at household level from the head of households. However, multistage sampling technique was employed in selecting the representative farm households used for this study. Lists of farm households (from the selected villages) registered with local Agricultural Extension Office were obtained. Households having less than 12.5 acre[1] farm were separated and distributed proportionally in all the four villages. Several studies reveal that marginal and small farmers are highly devoted to non-farm employment activities to fulfill their needs, therefore, this study has also focused household with small farms. Finally, the total sample of 196 farm households was developed by using the following formula:

$$n^2 = \frac{K^2\beta^2 N}{Ne^2 + K^2\beta^2} \quad (1)$$

where: n^2=sample size, K=maximum accepted error (its maximum value is 3 and 1/3rd of the sample variance), β^2=variance, e=error term, and N=total size of population.

2.4. Data collection

In this survey both primary and secondary data were collected from different sources to provide a more comprehensive picture of each aspect of the study. A structured questionnaire was designed to collect the primary data, in which both quantitative and qualitative data were gathered from the sample respondents through face to face interviews during the months of July to September, 2015. The questionnaire included information of demographic characteristic, socio-economic characteristics, household participation in farm and non-farm activities and the associated gross incomes generated in cash (and kind payments where applicable) in the survey year (12 months preceding time of data collection). Information on productive assets owned and household expenditure were also obtained. While secondary data were collected from available reports and records of the agriculture and rural development offices in the study area, published journals from websites and unpublished literatures from different sources.

2.5. Methods of data analysis

The Mean of Income Shares approach was used to estimate the income shares obtained by the farm households in the study area. This approach estimates the shares of incomes at the individual household level (Davis et al., 2010) by finding the share of each income source in the total household income for each household. The general Mean of Income Shares formula is given as:

[1] According to Pakistan Land Reform Regulations 1972, a **marginal farmer** is defined as a household which manages land less than 5 acres while a **small farmer** manages greater than or equal to 5 acres but less than 12.5 acres (Pakistan Agricultural Census Report, 2010).

$$MS_i = \frac{\sum_{h=1}^{n} \frac{y_{ih}}{Y_h}}{n} \quad (2)$$

Where; *i*=the income source, *y*=income from particular activity, *Y*=total income, *h*=the household, *n*=the number of households. Equation (1) is applied in this study as the sum of Total Household Income (THI) is given as:

$$THI = \sum_{j=1}^{7} Y_j \quad (3)$$

Where; *THI*=total household income, thus income coming from all sources *j j=1, 2, 3, 4....8,* farm and non-farm income.

However,

(a) The mean Share of Farm Income (SFI) is given as:

$$SFI = \sum \left(\frac{\sum \frac{gci}{thi}}{n} + \frac{\sum \frac{fci}{thi}}{n} + \frac{\sum \frac{vci}{thi}}{n} + \frac{\sum \frac{livsti}{thi}}{n} \right) \quad (4)$$

(b) The mean Share of Non-farm Income (SNFI) is given as:

$$SNFI = \sum \left(\frac{\sum \frac{nfwi}{thi}}{n} + \frac{\sum \frac{sei}{thi}}{n} + \frac{\sum \frac{othersi}{thi}}{n} \right) \quad (5)$$

Where; *sfi*=share of farm income, *snfi*=share of non-farm income, *thi*=total household income, *gci*= grain crop income, *fci*= fruit crop income, *vci*= vegetable crop income, *livsti*=livestock income, *nfwi*=non-farm wage income, *sei*=self-employment income, *othersi*=other sources income, *n*=number of households.

2.6. Ordinary Least Squares (OLS) model

The determining factors of non-farm income diversification such as farm size, household size, livestock holding, proximity to the nearest city, access to credit, age and education etc. have been found by numerous empirical studies. Therefore, for the present study, the same determinants of non-farm income diversification were tested in the study area. The popular econometric techniques used to analyze such determinants are logistic models e.g. Logit &

Probit (Giorgi 2001; Janowski & Bleahu 2001; Davis et al. 2010). By its very nature these models give probability of the existence or absence of a feature. However, in these models dependent variable is least affected by the magnitude of the independent variables. Another problem associated with these models is that the signs of parameters cannot be confidently interpreted (Gujrati, 2004). On the other hand, in the OLS analysis the dependent variable is affected by the magnitude of the independent variable and thus can provide more precise and consistent results. Besides that this technique, by the virtue of its BLUE properties, is free of both drawbacks of the logistic models. However, it should be cared that the results of OLS's models are valid when the basic assumptions of the model like non-existence of multicollinearity, autocorrelation and heteroscedasticity are not violated. In this study, the OLS technique is applied to analyze the determinants of non-farm income diversification. Econometrically:

$$Y= \beta_0.\beta_1X_1+\beta_2X_2 +\beta_3X_3 +\beta_4X_4 +\beta_5X_5 +\beta_6X_6 +\beta_7X_7 +\beta_8X_8 + e \quad (6)$$

where:

Y = Non-farm income generating activities
β_0 = Intercept and β_1. β_2. β_3. β_4. β_5. β_6. and β_7 are parameters
X_1 = Farm size operated by the respondents
X_2 = Household size
X_3 = Livestock holding in numbers
X_4 = Proximity to the nearest city
X_5 = Access to credit
X_6 = Age of respondent
X_7 = Education of the respondent
e = Error term

However, the respective model was estimated by using MS-Excel and SPSS statistical package 2012.

3. Results and Discussions

3.1. Socioeconomic characteristics of the households

The socioeconomic characteristics of the households are presented in *Table 2*.

The result of the analysis showed that male headed households (96.4%) dominated in the study area. Majority (88.3%) of the respondents were married with about 54.1% of the respondents having between 7 – 10 members per household. The average household size in the study area was 9. The relatively large household size can be linked to the need for family labor in the area as of at least 3 members of each household on average were involved in income generating activities. Age is an important socioeconomic characteristic as strength for required labor reduces with age. The modal age of the household heads in the study area was between 50 –

60 years. The implication of this is that majority of the household heads in the study area were becoming old and less active which could affect their productivity and income level. Majority of the respondents (60.7%) had no formal education, while 24.4% had primary education. Farming was the primary occupation and major source of income of the household heads. The respondents who were predominantly farmers had a modal farm size of about 1.5 – 2 acres and the average farm size was 1.89 acres which indicates that most of the farmers own smaller area of land.

Table 2. Descriptive Statistics of Households Socioeconomic Variables

Characteristics	Description	Frequency	Percentage
Gender of the household heads	Female	7	3.6
	Male	189	96.4
Marital status of the household heads	Married	173	88.3
	Unmarried	14	7.1
	Widowed/Separated	9	4.6
Age of household heads	28-38	32	16.4
	39-49	45	22.9
	50-60	79	40.3
	61-71	28	14.2
	>71	12	6.2
Formal education of the household heads	No formal education	119	60.7
	Primary education	48	24.4
	Secondary education	25	12.8
	Tertiary education	4	2.1
Farm size (Acres)	0.5-1	52	26.5
	1.5-2	93	47.4
	2.5-3	35	17.9
	>3.5	16	8.2
Household size	3-6	57	29.0
	7-10	106	54.1
	11-14	24	12.3
	15-18	9	4.6
Household member involved in income activites	1-3	102	52.0
	4-6	85	43.5
	7-9	9	4.5

Source: Survey Data, 2015

3.2. Farm households' participation rate in various income activities

Table 3 shows household's participation rate in the different income sources.

The data indicates that under farm activities, majority (32.54%) of the sample households was involved in vegetable farming followed by 26.19% in grain farming, 23.05% in fruit farming and

18.22% in livestock rearing. This indicates that farm households in the study area had diversified income sources within agricultural sector. However, the households were also equally involved in diversified non-farm income sources. Majority (56.57%) of the households was involved in self-employment income generating activities (such as shop keeping, petty trading, handicrafts, food processing, driving, private micro-entrepreneurship etc.) followed by 30.65% in non-farm wages (construction, manufacturing and sales workers etc.) and 12.78% in other activities (such as collecting rents and regular salaries etc.). This illustrates that farm households in the study area have been actively participating in multiple income generating activities, therefore, it is important to understand the sample households in terms of their occupational preferences.

Table 3. Farm Households' Participation Rate in Various Income Activities

Income Activities	Participation Rate (%)
Farm Activities	100.00
- Grain Crops	26.19
- Fruit Crops	23.05
- Vegetable Crops	32.54
- Livestock	18.22
Non-farm Activities	100.00
- Non-farm wages	30.65
- Self-employment income	56.57
- Others	12.78

Source: Survey Data, 2015.

3.3. Mean share of farm and non-farm income in the total household income

The mean share of farm and non-farm income in the total household income is explained in Table 4.

Mean Share of Farm Income: In this study, we divided the farm income sources into four categories i.e. income from grain crops, income from fruit crops, income from vegetable crops and income from livestock. During the survey, it was found that the most common crops grown in all the four villages were maize and wheat along with seasonal vegetables (such as tomato, potato, spinach, cauliflower, turnip, lady finger, garlic and onion etc.) for economic as well as household's own consumption. However, livestock rearing (such as buffalos, cows and goats) was found as a vital source of income in Lala and Jogian villages but in Urmar Miana and Urmar Bala, livestock was kept for households' personal use only. On the other hand, orchards of plum, pear and peach were the main fruit crops grown in Urmar Miana and Urmar Bala villages and used as a prime source of income of farm households. The results, in Table-3 revealed that the grain crops income source recorded the highest income share of 18.70% followed by

vegetable crops income share of 15.08%, fruit crops income share of 13.22%, and livestock share had 12.05% in the total household annual income. Thus, the total farm income share represents 59.05% of total household annual income. However, the diversity in the farm income is due to variation in geographical location and natural resources available to the households in their villages.

Table 4. Mean Share of Farm and Non-farm income in the Total Household Income

Income sources	Mean income share (%)
Farm Activities	100.00
- Grain Crops	18.70
- Fruit Crops	13.22
- Vegetable Crops	15.08
- Livestock	12.05
Non-farm Activities	40.95
- Non-farm wages	13.62
- Self-employment income	20.15
- Others	7.18
Total Household Income	100.00

Source: Survey Data, 2015.

Mean Share of Non-farm Income: During the survey, it was noticed that most households had one or more additional sources of income other than farming, therefore, we divided the non-farm income into three sources i.e. income from non-farm wage, income from self-employment, and income from other sources. The results in Table-3 revealed that the self-employment income share (20.15%) represents the largest share in the non-farm income share category. Non-farm wage income share follows with 13.62%, while other income source share recorded 7.18% respectively. In total, the share of non-farm income in total household annual income was found to be 40.95%, lower than the share of income generated from the farm sector by farm households.

The result demonstrates that the farm sector continues to be vital to farm households in the study area, since a major portion of their income is derived from activities in the sector. However, income from farming was no longer sustaining the households so the households had fairly diversified to other sources of income outside their farms. It is now well recognized that rural economy is not purely agricultural and that farm households across the study area earn an increasing share of their income from non-farm activities.

3.4. Determinants of non-farm income diversification

The result of the OLS regression estimates of the determinants of non-farm income diversification is presented in Table 5 given below:

Table 5. Estimated Non-Farm Income Functions

Variable (X_i)	Unit of Measurement	Estimated Coefficient (β)	Standard Error (e)	t-ratio	p-value
Farm size cultivated (X_1)	Acre	0.4370**	0.050127	6.843	0.000
Household size (X_2)	Number	0.31589**	0.7535	3.611	0.001
Livestock holding (X_3)	Number	-0.0054**	0.0197	-3.145	0.001
Proximity to the nearest city (X_4)	Kilometer	0.0610**	0.0190	3.210	0.000
Ccess to credit (X_5)	Rs.	1.8420	0.1820	1.582	0.117
Age of respondents (X_6)	Year	-0.5350**	0.1240	-3.941	0.000
Education of the respondent (X_7)	Year	0.1894**	0.5440	3.341	0.001
Constant	-	1.3951**	0.411	3.502	0.001
F=41.20, R^2=0.795, Adjusted R^2=0.775, Durbin Watson=1.794, **Significant at 1%					

Source: Survey Data, 2015.

The F-statistic is large and significant and the values of R^2 and R^2 adjusted are high for this cross sectional data which proves the model as a whole is statistically significant. The value of R^2 is 0.795 which implies that 79.50% of the variation in the dependent variable Y is explained by the variations in the independent variables included in the model. While R^2 adjusted measures the proportion of the variance in the dependent variable that is explained by the variation in the independent variables. R^2 adjusted in this case shows that 0.775% of the variation in the dependent variable is explained by the independent variables. The results of individual variables show that Age and Livestock holding were negatively related to non-farm income diversification, while the Farm size, Household size, Education level of household heads and Proximity to the nearest city positively impacted the dependent variable. The only variable found to be insignificant was Access to Credit. All the coefficients carry correct signs giving us considerable confidence in the results. The findings of individual explanatory variables are interpreted in the proceeding paragraphs.

Farm Size was positively associated with non-farm income diversification. Land was a very important resource in the study area and due to the fragmented nature of land holdings the sample households had smaller farms for cultivation which pushed them to non-farm income activities. Thus, the positive sign of the variable is correct according to economic theory and findings of the research previously done on the same topic. Therefore, we accept the hypothesis of correlation between farm size and non-farm income diversification. The results indicate that decrease in the farm size will definitely increase non-farm income activities.

Household size was significant and positively related with the non-farm income diversification. The values reveal that farm household with large members, on average; devote more time to non-farm activities. This may be due to the fact that the increase in farm household size means an increase in family labor. On the other hand, larger farm households diversify more as much of their income is geared towards consumption and for household needs. This attests the hypothesis of positive correlation between household size and non-farm income diversification.

Livestock was negatively correlated with non-farm income diversification. The ratio is also significant and results are also in accordance with economic theory. Livestock is among the productive assets which are mostly agricultural and can be seen as proxies for socio-economic group or wealth. Members of farm households which are relatively well-off are likely to participate in non-farm jobs but when they do, they spend relatively less time in this activity.

Proximity to the nearest city was found significant and positively correlated with non-farm income diversification. This is because of greater business, wage work, and public/private job opportunities available to the people. Hence, proximity to local markets increased the likelihood of non-farm employment participation.

Credit which is another indicator of financial status in the model is not found to affect the participation decision.

Age of the heads of households had significant and negative relationship with non-farm income diversification, which meant that as the age of farmer increases, his willingness or ability to work non-farm decreases. This is because they lack the physical strength and financial resources to add on to their farm or non-farm activities since a majority of these activities are found to be labor intensive. However, the younger household members were highly devoted to non-farm employment activities and they might support their heads in terms of financial support.

Education level of the household heads was significant and positively influenced income diversification among farm households in the study area. Thus, having some educational level attainment facilitates entry into high paying jobs such as public and private services, businesses, masters of transport stations, as well as improving farmers understanding of farming practices and related issues as observed by this study.

4. CONCLUSIONS AND RECOMMENDATIONS

The empirical analysis of the household income revealed that the estimated shares of the income sources in the household's total income have justified the importance of farm as well as non-farm income practiced by farm households. Even though agriculture is the dominant source

of income for farm household, 40.95 percent of the contribution of non-farm sources clearly points to the fact that participation in the non-farm employment activities is extremely important towards increasing the absolute income of small farmers. Non-farm income diversification is hence crucial for sustaining livelihoods and an integral dimension for strengthening rural economies. The result reveals that small size of landholdings and lower farm profits tend to push farm households out of agriculture, however, pull factors such as self-employment and public/private services are dominantly found to be the most important drivers of participation in non-farm employment because of proximity to the nearest city. Households' decision to participate in non-farm work is principally to increase their earnings and not on the intention of risk reduction as opposed to households whose decision to diversify is due to push factors. This is a clear indication that farming is not a sufficient source of revenue for the farm households in the study area.

From a policy perspective, the findings suggest that, although most households participate in the farm sector, rural development policies aimed at poverty reduction should focus equally on both the farm and the non-farm sectors. Farming as a primary source of income has failed to guarantee sufficient livelihood for most farming households in developing countries and agricultural development policies have largely produced little improvement, especially in Pakistan. Non-farm activities have been meeting the gap by directly increasing households' income and providing cash that is invested in farm inputs to increase agricultural production and also raising their living standards. The concern therefore should be to implement policies that will impact positively on both sectors for overall improvement in rural life. Given the complementarities between non-farm and farm activities and the fact that both sectors actually face similar constraints, application of appropriate policy programs that can serve both sectors is recommended. For instance, removing credit market imperfections and creation of accessible credit schemes can facilitate the establishment of non-farm businesses and promote agricultural development simultaneously. Likewise, provision of physical infrastructure can reduce transaction costs in both sectors and increase overall employment opportunities.

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MERCURY RETROGRADE EFFECT IN CAPITAL MARKETS: TRUTH OR ILLUSION?

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From the most ancient times, the astrological beliefs have played an important role in human history, thinking, world-views, language and other elements of social culture. The practice of relating the movement of celestial bodies to events in financial markets is relatively newer but despite the inconsistency between financial astrology and standard economic or financial theory, it seems to be largely spread among capital market traders. This paper evaluates one of the astrological effects on the capital market, more precisely the Mercury retrograde effect on US capital market. Despite the fact that it is just an optical illusion the astrological tradition says that Mercury retrograde periods are characterized by confusion and miscommunications. The trades could be less effective, the individuals more prone to make mistakes so there is a long-held belief that it is better to avoid set plans during Mercury retrograde, signing contracts, starting new ventures or open new stock market positions. The main findings of this study are lower return's volatilities in the Mercury retrograde periods, inconsistent with the astrologic theories assumptions but consistent with the idea that trader's beliefs in Mercury retrograde effect could change the market volatility exactly in the opposite sense than the predicted one.

Keywords: Beliefs, Behavior, Mercury retrograde, Returns, Volatility.

JEL Classification: G02, G10, D53.

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1. Celestial Bodies, Mood and Decision

Science or pseudo-science as its critics are denoting it, astrology has very deep roots in the history of mankind. Among the first things a child says there is a question: "why?" (why does the sun shine, why there is night and day, why we are so different, why we express our feelings so diversely, why do things happen even when one cannot see a reason for them...?) Probably one of the reasons why the astrology has played such an important role in history is because it attempts to bring answers to these questions and more than that it provides a set of forecasting techniques and tools people have always desired[1].

The important question that arises is: what is the channel used to influence human decision? Psychological and medical studies have linked the celestial bodies' position and evolution stage to decision using the mood channel and the biorhythm[2] as a mood determinant.

Mood and potential changes of mood seem to influence decision making and securities prices both through *cognitive-evaluation* and *risk-tolerance.*

Good mood increases the ability of categorization, creativity in response-generation tasks and efficiency in solving multi-attribute decision problems (Pham, 2007) but individuals in positive mood tend to rely on stereotypes and judgmental heuristics and have a higher propensity to optimism and overconfidence biases (Hoffrage, 2004). A negative mood seems to produce different effects depending on its cause. For instance, sadness decreases the use of scripts and stereotypes and triggers a more systematic, data-driven form of reasoning since sad moods represent a signal for the individual that a more vigilant form of processing is required (Schwarz, 2002). Anger and disgust lead to heuristic rather than systematic processing (Triedens & Linton, 2001).

[1] Its beginnings are associated with the first attempts to measure, record and predict seasonal changes by reference to astronomical cycles, made by human beings Burckhardt (1969). Babylonian astrology was the first organised system of astrology, dated in the 2nd millennium BC even if there are some isolated references regarding other similar forms that appeared in the Sumerian period in 3rd millennium BC (Holden, 1996). The astrology evolution as a science was not smooth at all. Despite the fact that until the 17th century, astrology was considered a scholarly tradition, commonly accepted in political and cultural circles, meteorology and medicine, by the end of 17th century due to the advances in astronomy, it lost its academic standing (Barton, 1994). If until the 17th century astrology was widely recognized, nowadays people are more afraid of mockery and pretend not to believe in it. Still, the number of the ones who admit that astrology plays an important role in their life and decision is not that small: Pew Research Center (2009) determine, based on a survey study, that more than 25% from Americans believe in astrology.

[2] The idea of different biorhythm cycles that influence human behaviour can be traced back to the German surgeon Wilhelm Fliess in the 1890s who proposed a 23-day male period and a 28-day female period (in Hines, 1988).

The link between *mood and risk taking* it is still a controversial topic due to the quite opposite theories from the literature: Mood Maintenance Hypothesis (MMH) proposed by Isen, Nygren,& Ashby (1988) and Affect Diffusion Model (AIM) proposed by Forgas (1995).

The MMH model starts from the idea that the main goal of any individual is to achieve and maintain a state of well-being. If the individual experiences a good mood state, he will avoid risky situations in order to preserve the good state. In the case of a bad mood situation, the individual will choose riskier alternatives hoping that the possible gains will lift his spirit. The effect of human sentiment on the decision making process is also analyzed by Forgas (1995) but the direction of the supposed effect is opposite. The AIM model suggests instead that subjects in bad mood have a more pessimistic view of the world, perceive situations as riskier, and have, as a result, a lower propensity toward risk taking. On the other hand, individuals in a positive affective state, who usually have a more optimistic view and perceive a safer environment, should be more prone to risk taking.

One could think that those two theories cannot be both true, but in fact they can. Individuals are pretty different; hence, the impact of changes of mood may have heterogeneous effects on the risk taking attitude. The relation between mood and risk taking is influenced by several factors such as gender, age, genetic heritage, functioning of the endocrine system and personality traits (for more details see Murgea, 2014).

Among mood determinants, biorhythm seems to play a pretty important role. Recent studies identified three different biorhythm cycles: a 23-day cycle influences physical aspects such as energy, resistance to disease, endurance; a 28-day cycle influences emotions such as sadness, elation, moodiness, creativity and a 33-day cycle influences intellectual functions such as alertness, memory and reasoning ability.

Great attention has been paid to what influence human biorhythm. Among those, the sun, the lunar cycle and the position of other planets have been proved to be among the main factors. As a direct result our biological balances are influenced, the adaptation mechanisms are impaired and the appearance of different mood disorders, especially depression and anxiety, is facilitated affecting also the decision mechanism.

In this framework, the present paper aim is to assess the influence of planet Mercury the smallest and closest to the Sun, on the American capital market. The topic may seem peculiar the first sight since from our knowledge there is no scientific literature, neither psychological nor medical, neither financial to connect the Mercury retrograde with mood or capital market evolution. Despite that, there is a huge tendency among traders to considerate that in the periods when Mercury is retrograde they should avoid important decisions due to a higher market volatility and instability. Considering this, the aim of the paper is to see if there is a

connection between Mercury retrograde and American markets returns and, if there is something like this how one can explain it.

The paper is structured as follows: the second section explains the use of financial astrology in capital markets, presents the former studies that connect the celestial bodies evolutions with the capital markets evolutions and offers some astrological explanations regarding the Mercury retrograde, the third section is dedicated to the data, methodology and result, the fourth section discusses the results and concludes.

2. Financial Astrology, Behavioral Finance and Capital Market Evolutions

2.1. Financial astrology and trading activities

The use of astrology in capital market analysis is both complex and controversial. It's a proven fact that the sun, the moon, and other heavenly bodies affect the amount of serotonin in your brain and further the mood. According to Bonner & Rajiva (2007) this makes astrology a potential useful tool for predicting stock market trends.

The first attempt to use financial astrology belongs to a well-known trader in 1950s, W. D. Gann, who used a strategy based on the Jupiter-Saturn cycle, to facilitate his trading activities. He considered that since Jupiter and Saturn are the biggest planets in our solar system, they have one of the strongest influences when they are in line. The gravitational pull created determines the Sun to shift periodically. This shift generates weather changes, mood changes and in the final fluctuations in securities prices (Colby, 2003).

Nowadays, since astrology is no longer considered a science, the interest in the subject has moved from the academia to technical analysts, but the interest is in some of the cases kept secret[3] , because of the fear of mockery. The most prominent technical analysts who use astrology in their trading strategies are Arch Crawford and Bill Meridian. Arch Crawford has been named "Wall Street's best known astrologer" by Barron's Financial Weekly being famous both for calling the Crash of '87 months in advance and for the correct prediction of the bear markets in July 1990 and March 2000 (Colby, 2003). Bill Meridian is a very well-known researcher, fund manager, and designer of analytical software able to compute correlations between time series data and planetary cycles (Lo & Hasanhodzic, 2011). Lately, further literature makes the connection between the movement of planets and the market volatility and lays out the principles that allow the trader to properly use the tools of financial astrology (a very good example in this sense is Pasavento & Smoleny, 2015).

[3] Large firms as J.P. Morgan refuse to make comments regarding this practice but the founder, John Pierpont Morgan has personal astrologer. Also his remark on this topic remains famous: *"Millionaires don't use astrologers, but billionaires do"* in Kleinfield, 1988.

Financial astrology uses different instruments and tools to forecast capital markets cycles according with the celestial bodies' cycles. One of the most known cycles among the astro-traders is the one of the retrograde Mercury. Three times per year, as seen from the Earth, Mercury appears to slow down in its progress through the zodiac, stop and move backward (retrograde). Despite the fact that it is just an optical illusion the astrological tradition says that Mercury retrograde periods are characterized by confusion and miscommunications. The trades could be less effective, the individuals are more prone to make mistakes so there is a long-held belief that it is better to avoid set plans during Mercury retrograde, signing contracts, forming partnerships, starting new ventures or open new stock market positions. While some astro-traders prefer to step aside from active trading and avoid the markets altogether while Mercury is retrograde some others prefer to try to use it for Mercury retrograde based strategies since in many cases Mercury retrograde periods coincide with trend reversals or with short-term counter-trends in the context of broader market moves (a very good example in this sense could be depicted from Bost, 2012).

2.2. The moon, the sun and capital market returns

During the last decades several behavioral finance studies have tried to prove the presence of a connection between moon cycles, sun and evolution and capital markets.

The belief that the moon exerts an influence on human behavior is widespread both among specialists and the general public, in spite of the little empirical evidence from psychology and medicine. Vance (1995) reported that 81% of mental health professionals believe that full moon alters individual behavior. Out of the eight moon phases observed by Galileo Galilei both superstitious beliefs and academic studies take into consideration only two: full moon and new moon. Due to the extra-light the full moon produces, the quantity and quality of sleep is prone to decrease. This leads to various behavioral changes, including mania through sleep deprivation. Conforming to Hippocrates's view that" no physician should be entrusted with the treatment of disease who was ignorant of the science of astronomy" (White, 1914), several studies claim that moon alters human behavior and increases the propensity for violence, suicides, accidents and aggression (Thakur et al., 1987; Hicks et al., 1992). On the other hand, no influence of the moon phases was found in any of the following studies, investigating the frequency of calls reporting disturbing behavior (Byrnes & Kelly, 1992), suicidal tendency (Mathew et al., 1991; Martin et al., 1992), hospital admission due to mental health emergencies and antisocial behavior (Adamou, 2001), increase in incidence and severity of traumatic injuries (Coates et al., 1989), madness (Iosif & Ballon, 2012).

Based on these findings, several researchers attempted to find a connection between fool moon and capital markets. Dichev & Janes (2003) observe lower returns around the full moon due to the heightened risk-aversion and more pessimistic prospects of future cash-flows, in US market and 24 other countries over a 30-year period. The findings by Dichev & Janes (2003) are

basically confirmed in Yuan et al. *(*2006), Nissim et al. (2012). Yuan et al. (2006) state that lunar effect is independent of announcements of macroeconomic indicators, global shocks or other calendar related anomalies, but that it is stronger for emerging economies.

By contrary, Gerlach (2007) finds a lunar pattern in the US market, with higher returns associated with full moon days, mainly due to the announcement days. The same correlation line is found by Liu (2009), who shows that for most of his sample of emergent Asian economies the full moon effect determines not lower but higher returns, whereas they are inversely related to company size in the US case.

The sun effect can be seen in several studies but the connection with capital markets is less direct than the one with the moon. The sunshine effect, the impact of geomagnetic storms (a geomagnetic storm consists in a temporary disturbance of the Earth's magnetosphere determined by an interaction between a strong solar wind shock wave and the Earth's magnetic field) and Seasonal Affective Disorder (Photoperiod (the number of hours of daylight is connected with the seasonal affective disorder - SAD, a subtype of depression characterized by changes in mood, energy, sleep, eating habits and social activities at the change of season) are just several lines of analysis for this effect.

The sunshine effect on mood is widely discussed (Cunningham, 1979; Persinger & Levesque, 1983; Parrott & Sabini, 1990). Denissen et al. (2008) find a significant negative effect of temperature, wind power and sunlight on mood. The main explanation offered for the negative effect of sunlight may be due to the role vitamin D3 (produced when the skin is exposed to sunlight) plays in changing the serotonin level in the brain (Lambert et al., 2002).

Krivelyova & Robotti (2003) analyzed the impact of geomagnetic storms on stock market returns in nine countries, channeled by depression and anxiety. The main results have pointed out that, especially in the small capitalization stocks, geomagnetic storms seem to have a profound effect on risk aversion and indirectly to equity returns. The same results regarding the impact of geomagnetic storms on risk were confirmed by Dowling & Lucey (2008b) on an extended sample of 37 countries.

Finance researchers have tried to establish a relation between the number of hours of daylight and equity returns based on psychological evidences. Through the link between SAD and depression and between depression and lowered risk aversion, Kamstra et al. (2003) find that seasonal depression, in a nine countries sample, is strongly linked to seasonal variations in stock returns. Dowling & Lucey (2005) found a correlation, between Irish equity returns and SAD but only between the Winter Solstice and the Spring Equinox. Testing SAD effect on the UK stock market Dowling & Lucey (2008a), have found evidences of a SAD effect for the UK Small Index and in the opposite direction for the UK Main Index. In another study realized on a sample of 37

countries, a SAD effect for small caps is also found (Dowling & Lucey, 2008b) but the effect is more pronounced for countries which are farther away from the equator.

Considering financial astrology practice on the one side and the consistent body of behavioral finance literature regarding moon and sun effect on the other side, we decided to test the presence of abnormal returns in US capital market during the Mercury retrograde periods and to see if the traditional astrologic explanation could fit the empirical results.

3. Data, Methodology and Results

To investigate the presence of abnormal differences in returns in the Mercury retrograde periods we have chosen two of the most important indices on American stock market: DJIA and S&P 500, on a period that range between 1st of February 1993 to 31st December 2012.

The market has been chosen considering two very important factors. On the one side, USA capital market is one of the most efficient capital markets and in theory this kind of calendar effect should be less present but, on the other side, the financial astrology field is more developed here than in any other part of the world. Those two arguments make USA a very good case for our study.

The closing prices were computed in daily returns and tested for stationarity with Augmented Dickey-Fuller, Elliott-Rothenberg-Stock DF-GLS and Phillips-Perron test. The results show that none of them have unit roots (tests results available at request).

As a proxy for Mercury retrograde effect we have chosen, according with previous behavioral finance studies that analyzed other celestial bodies influence in capital markets, to use dummy variables computed as follows:

$$DMR \begin{cases} 1 \text{ for the Mercury retrogrades days} \\ 0 \text{ for the other days} \end{cases}$$

The main hypothesis we intend to test could be formulated as follows:

H1: The mercury retrograde periods are indeed characterized by higher market volatility and as a consequence the traders should adapt their strategies according to their willingness to bear this extra risk for a potential supplementary return

or

H2: The mercury retrograde periods are characterized by lower market volatility as a consequence of the trader beliefs in mercury retrograde and their market avoidance during those periods.

The main assumption of the proposed model is that the current difference in return depends both on the previous return but also on the past differences because the investors are usually tempted to perceive high volatilities as a sign of an enhanced risk. Their attitude in front of this perception will be translated in further trades which will in the final increase the gap of returns. Thus, the proposed model considers the dynamic character of return series and has the following specifications:

$$DR_nIndex_t = c + \beta RIndex_{t-1} + \sum_{n=2}^{m} \alpha_n DR_nIndex_t + \gamma DMR_t + \varepsilon_t \quad (1)$$

where:

c = constant
$RIndex_t$ = (index closing price $_t$-index closing price $_{t-1}$)/ index closing price $_{t-1}$
$DR_nIndex_t = RIndex_t - RIndex_{t-n}$
DMR_t = dummy variable for Mercury retrograde
β, α, γ = importance coeficients
ε_t = standard error

For the two indices the formulas, using the same algorithm, become:

$$DR_1DJIA_t = c + \beta RDJIA_{t-1} + \sum_{n=2}^{m} \alpha DR_nDJIA_t + \gamma DMR_t + \varepsilon_t \quad (2)$$

and

$$DR_1S_P500_t = c + \beta RS_{t-1} + \sum_{n=2}^{m} \alpha DR_nIndex_t + \gamma DMR_t + \varepsilon_t \quad (3)$$

where RDJIA and RS_P500 stand for the daily return of DJIA and daily return of S&P500.

Testing the following benchmark, we noticed that the former five differences in returns are significant for the present differences in return. The quality of the model increases when more past differences are introduced (from model 1 to model 4) as one could see in the next two tables because the present volatility is better explained by a longer volatilities history.

Table 1. Regression results for DJIA

Variables	Coefficients			
	Model 1	Model 2	Model 3	Model 4
C	0.000364***	0.000376***	0.000374***	0.000367***
	(0.000125)	(0.000102)	(0.000008)	(0.000007)
RDJIA(-1)	-1.058996***	-1.054544***	-1.034967***	-1.028729***
	(0.009733)	(0.007899)	(0.006716)	(0.005907)
DMR	-0.000387	-0.000451**	-0.000465**	-0.000438***
	(0.000280)	(0.000227)	(0.000193)	(0.000169)
D2RDJIA	0.499994***	0.349084***	0.263288***	0.200492***
	(0.006733)	(0.006214)	(0.005618)	(0.005205)

Variables	Coefficients			
	Model 1	Model 2	Model 3	Model 4
D3RDJIA		0.327584*** (0.006428)	0.251032*** (0.005721)	0.203464*** (0.005182)
D4RDJIA			0.251695*** (0.005701)	0.206689*** (0.005147)
D5RDJIA				0.199311*** (0.005200)
R-squared	0.776210	0.852723	0.894064	0.918150
Adjusted R-squared	0.776075	0.852605	0.893958	0.918052
Akaike info criterion	-6.838981	-7.256777	-7.585673	-7.843077
Schwarz criterion	-6.833774	- 7.250266	- 7.577859	- 7.833959
F-statistic	5784.248	7238.857	8437.941	9342.276
Prob (F-statistic)	0.000000	0.000000	0.000000	0.000000
No of observations	5007	5006	5005	5004

** stands for a probability that ranges from 0.1 to 1*
*** stands for a probability that ranges from 0.05 to 0.1*
**** stands for a probability that ranges from 0 to 0.05*

Table 2. Regression results for S&P500

Variables	Coefficients			
	Model 1	Model 2	Model 3	Model 4
C	0.000323*** (0.000132)	0.000330*** (0.000106)	0.000328*** (0.000009)	0.000320*** (0.000007)
RS_P500(-1)	-1.067676*** (0.0000)	-1.060158*** (0.007830)	-1.042578*** (0.006641)	-1.035558*** (0.005821)
DMR	-0.000382 (0.1960)	-0.000426* (0.000238)	-0.000431** (0.000202)	-0.000400** (0.000177)
D2RS_P500	0.499980*** (0.0000)	0.347300*** (0.006157)	0.261366*** (0.005618)	0.200596*** (0.005115)
D3RS_P500		0.329714*** (0.006324)	0.254023*** (0.005618)	0.204871*** (0.005082)
D4RS_P500			0.250420*** (0.005631)	0.206370*** (0.005061)
D5RS_P500				0.198948*** (0.005111)
R-squared	0.778452	0.856469	0.897160	0.921091
Adjusted R-squared	0.778319	0.006734	0.897057	0.920997
Akaike info criterion	-6.728703	-7.162209	-7.495013	-7.759297
Schwarz criterion	-6.723496	-7.155698	-7.487199	-7.750180
F-statistic	5859.673	7460.412	8722.096	9721.562
Prob (F-statistic)	0.000000	0.000000	0.000000	0.000000
No of observations	5007	5006	5005	5004

** stands for a probability that ranges from 0.1 to 1*
*** stands for a probability that ranges from 0.05 to 0.1*
**** stands for a probability that ranges from 0 to 0.05*

Also, for both indices, there is a statistically significant negative correlation between Mercury retrograde periods and return's volatility, inconsistent with the astrological theories.

The interesting fact is that, despite this inconsistency, the traders 'beliefs in Mercury retrograde could be the determinant of this reduced volatility. Their tendency to avoid trading in this period could reverse in fact the market trend predicted by astrological theories (in theory Mercury retrograde period should be characterized by an increased return volatility, to fit with the assumptions that in those periods trend reversals or short-term counter-trends in the context of broader market moves may occur).

4. Final Remarks

The results seem to be inconsistent with the idea of trends reversals from the astrological theories connected with Mercury retrograde. The regressions coefficients show a negative not very strong, but statistically significant correlation between the return's volatility and the dummy variable in the periods when Mercury seems to go backwards.

Several possible explanations could back up these results. First, as any other anomaly on the capital market, as long as the market already knows about it there is a strong possibility for it to be attenuated, to reverse or even to disappear (Schwert, 2003). Mercury retrograde oriented strategy may in time reverse the process as long as the traders which apply them prevail on the market. Second, even if there is not such an influence, only the trade absence which often characterizes the traders in this period could lead to a lower volatility in market returns. In a new research, Anginer et al. (2015) offer empirical proof that the predictive ability of anomalies usually survive when the direction of insider trading agrees with the anomaly but completely disappears in the opposite case.

Another supplementary explanation could be associated with market environment changes as improved liquidity, increased number and traded volumes of the institutional investors, decreased trading costs and expanded regulations and information disclosure (Fu & Huang, 2015).

In any case the result of the present study points out that the market does not evolve as the astrological theories state but the belief in a strong volatility during Mercury retrograde periods could be in fact one of the important reasons why the market shows a lower volatility in those periods.

The findings of the present study could be extremely useful both for the capital markets individual and institutional investors because anomaly-based strategies could be created using the results. In a market where a lot of participants restrain themselves from trading in Mercury retrograde period a smart investor could use this trend in his favor.

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ECONOMETRIC ANALYSIS OF DETERMINANTS OF REAL EFFECTIVE EXCHANGE RATE IN NIGERIA (1960-2015)

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This study investigates the determinants of real effective exchange rate in Nigeria for the period between 1960 and 2015 using the vector error correction mechanism to separate long run from the short run fundamentals. The findings from the regression estimates revealed that; terms of trade, openness of the economy, net capital inflow and total government expenditure were the major long run determinants of real effective exchange rate in the country while variables such as; broad money supply (M2), nominal effective exchange rate, structural adjustment program dummy, June 12 crisis and change to civil rule dummies were revealed as the major short run determinants of exchange rate in Nigeria between 1960 and 2015. The study concludes by recommending that since the major variable of terms of trade (crude oil price) is out of the government control, the effect of shocks due to the fluctuations of crude oil price can be minimized by shifting the economy from a mono-product nation and diversify the economy to increase productive capacity. Also, the change to civil rule dummy used in the study revealed that the system has not been friendly with the country's real effective exchange rate, thus needing to review the system and bringing out all negative activities there in to ensure Nigeria's currency appreciation. Guided openness is also suggested to avert the danger that unguided trade liberalization may bring into the country.

Keywords: Exchange rate, Terms of trade, Openness, Civil rule, SAP, Government expenditure.

JEL Classification: **O30, F32.**

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1. Introduction

One of the most challenging problems in the third world countries such as Nigeria is the exchange rate management,that is, 'getting the exchange rate right' especially in the context of exchange rate determination and major factors responsible for the exchange rate fluctuations (Williamson,2008 and Abdelbeky,2005). In particular, the exchange rate has been recognized to be an important link between the internal economy of a country and the international economy as such an important variable which must be gotten right at all time. According to Eichengreen (2007), given the very limited flexibility of internal prices, the nominal exchange rate is the key to the determination of the real exchange rate in the short and long term. Real exchange rates are in turn of key importance in determining macroeconomic stability and the incentive to engage in trade. As a result of this, much professional attention has been devoted to analyzing both what actually determines exchange rates and how a government that wants to ensure a sustainable growth rate should approach the issue of exchange rate determination (Dosse, 2007). Moreover, the country has been facing greater challenges in terms of exchange depreciation since the inception of the last democratic elected government, consequent from the down fall of crude oil price at international market and thus the need to investigate what factors actually determine the exchange rate in Nigeria. The outcome of which can be used to strengthening the naira by focusing on mainly those factors that significantly influenced Nigeria's exchange rate with its major trade partners and as such manage the exchange rate to a level that will minimize fluctuations.

Apart from this introductory section, the next section will review the relevant literature, section three deals with the methodology and the theoretical framework, in section four, results are presented and discussed while section five concludes the work.

2. Literature review

This section reviews the relevant literature on the basic concepts of exchange rate and determinants of real exchange rate.

2.1.Measurement of real exchange rate and real effective exchange rate

The task of deciding which measure of the exchange rate is the most appropriate is usually faced with two sets of issues. According to Chinn (2002), the first is between the theoretically applied measures and the real world counterparts. The second one is between using the most appropriate measure conceptually and using a measure based on the most readily available data. In short, the translation from the real exchange rate theory to real- world data is not straightforward, judgment is required when selecting or constructing an exchange rate measure for empirical research. For instance, at the empirical level, due to the problem of getting data on

the relative price of tradable goods to the price of non-tradable goods many authors continue to proxy the real exchange rate by nominal exchange rate adjusted for movements in the prices of foreign and domestic countries (Sundararajan et al., 1999; Jimoh, 2006; Jongwanich, 2009). That is:

$$R_t = \frac{E_t P_t^*}{P_t} \tag{1}$$

where, R_t is the real exchange rate at time t, E_t is the nominal exchange rate, P_t is the domestic price while P^*_t is the foreign price at time t respectively.

Also, the empirical treatment of the real effective exchange rate typically abstract from how to measure exchange rates when countries engage in transactions with a number of partners. In such a case, equation (1) can be weighted to obtain the empirical measurement of the real effective exchange rate. Such that, using the arithmetic weighed method as used for the nominal exchange rate in equation above, the real effective exchange rate is measured as below:

$$REER_t = \sum_{i=1}^{n} w_{it} \frac{E_{it} P_{it}^*}{P_t} \tag{2}$$

Where, $REER_t$ is the real effective exchange rate at time t, E_t is the nominal exchange rate, P_t is the domestic price while P^*_t is the foreign price at time t respectively, w_{it} is the weight attached to each trade partner.

Using the geometric weighted method, the real effective exchange rates is measured as:

$$REER_t = \prod_{i=1}^{n} w_{it} \frac{E_{it} P_{it}^*}{P_t} \tag{3}$$

All definitions of variables are as given previously. The trade weight (w_{it}) of the trading partners is sum to 1(Chinn, 2006:122).

The weight to be given to each bilateral rate is commonly based on the share of total imports, exports or total exports and imports. When data from only major trading partners are used for the computation, the weight to be given to country's bilateral rate is computed as the country's total import and export to the domestic economy as a percentage of the domestic country's total export and import from all the selected trading partners.

Other issues involved in the measurement of effective exchange rate include the choice of price index and the choice of trade partners among others. In practice, the choice of prices to employ usually depends on the relative price that best reflect the relative price of tradable goods to non-tradable goods. The indices available are: the consumer price index (CPI), the producer price index

(PPI), the wholesale price index (WPI), the export price index (EPI) and the GDP deflator (Chinn, 2006). The most commonly used price series are consumer price index. Although there are theoretical reasons to prefer other types of price index when measuring competitiveness (Koch, 1984), CPIs have the advantage of being timely and available for a wide range of countries over a long period of time. According to Chinn (2002), for the purposes of calculating the relative price of tradable goods, the preferred measure is the exchange rate deflated by PPIs or WPIs. One drawback of using these indices is that, there is considerably more variation in how these price series are constructed across countries, than for the corresponding CPIs (Chinn, 2002; 2006).

Concerning the choice of countries to include and their relative weights, in principle, all countries that trade with a domestic country should be included. In practice, data limitations tend to restrict the number of countries that can be considered. The actual selection is determined by practical considerations, efforts are made to ensure that the currencies included account for a high proportion of total trade of the country in question (Chinn, 2006).

2.2. Exchange rate fundamentals

Many studies have provided a detailed explanation of the real exchange rate fundamentals (Edwards, 1988a, Sundararajan et al. 1999; Clark and MacDonald, 1998, Agu, 2002; Raghuram, 2006).

According to Clark and MacDonald (1998), fundamentals can be classified into two groups: external fundamentals and domestic fundamentals. The external fundamentals include: terms of trade, and net foreign assets. Domestic real exchange rate fundamentals consist of variables that can be directly affected by policy decisions and those that cannot be affected by policy decisions. Policy-related fundamentals are, trade restrictions such as import tariffs, import quotas, export tax and the composition of government expenditure. Domestic non-policy real exchange rate fundamental such as technological progress is another important determinant established by the literature. Rughuram (2006) considered a few general cases in order to explain how the fundamental variables determine the equilibrium real exchange rate.

Terms of trade: This is defined as the ratio of export price index to import price index (P_X/P_M). Term of trade is one of the main fundamentals that influence the real exchange rate. If the term of trade increases it will raise the purchasing power of people and this results in an increase in the demand for domestic goods (Raghuram, 2006). An improvement in the terms of trade has both income and substitution effects. The income effect of such improvement is that due to increase in real income, more is spent on both tradable goods and non-tradable goods, resulting in higher prices of non-tradable goods leading to real exchange rate appreciation. On the other hand, the substitution effect of such improvement is that a change in the relative prices of the two goods (exportable and importable), lead to an increase in the domestic production of

exportable goods, wages in the sector increase, and result in high demand for importable goods and fall in the demand for non-tradable goods. Thus, the real exchange rate depreciates. If the income effect associated with terms of trade improvement is stronger than the substitution effect, an appreciation of the real exchange rate will occur; otherwise, the real exchange rate will depreciate.

Trade Policy: The imposition of an import tariff will increase the domestic price of importable goods and generate both substitution and income effects. Using the price-specie mechanism, the income effect stems from the fact that, an imposition of import tariff leads to increase in the domestic price of importable goods and this can further result into an increase in the prices of domestic goods, real income falls and thus a reduction in the demand for both tradable goods and non-tradable goods. Since the price of tradable goods is determined exogenously (fixed), a proportionate fall in the price of non-tradable goods leads to real exchange rate depreciation. On the other hand, substitution effect results from the fact that, an imposition of import tariff leads to increase in the domestic price of imports. Due to higher price, demand for importable goods reduces and demand for non-tradable goods increases. As a result of higher demand for non-tradable goods, prices of non-tradable goods increase and this leads to real exchange rate appreciation. However, since the imposition of tariff results in both substitution and income effect, the real exchange rate can depreciate or appreciate. This depends on whether the income or substitution effect of trade restrictions dominates. Clark and MacDonald(1998) note that, in most cases, the substitution effect of trade restrictions dominates and thus, increasing restrictions leads to a higher relative rise in the price of importable goods and results in the real exchange rate appreciation. The reduction of trade restrictions results into the real exchange rate depreciation.

Net foreign asset: In a more general framework, both net foreign assets and the real exchange rate should be viewed as endogenous variables that influence each other and are determined simultaneously (Montiel, 1997). The transmission to the real exchange rate is based on the conclusion that at equilibrium, a country with negative net foreign assets must have a trade surplus to finance the stream of interest and dividend payments. The mechanism to generate this trade surplus is real exchange rate depreciation. Similarly, countries with positive net foreign assets must have trade deficits in equilibrium. Thus, a shock to net foreign assets has a long-run effect on the real exchange rate as long as goods produced in different countries are not perfect substitutes. While shocks to the real exchange rate have a well-defined short-run effect on net foreign assets, their long-run effect is ambiguous. Such shocks have no effect on net foreign assets unless they affect a country's saving rate permanently. In some simple models of trade and asset accumulation, exchange rate shocks have no long-run effect on net foreign assets, and net foreign asset shocks do have a long-run effect on the real exchange rate (Montiel, 1997).

Government expenditure: Government expenditure is also another fundamental variable which determines the equilibrium real exchange rate. The effect of government expenditure on the equilibrium real exchange rate depends on the composition of the expenditure between tradable goods and non-tradable goods. If a greater share of the government expenditure is on non-tradable goods there will be an increase in the demand for non-tradable goods in the short run and that raise up the prices of non-tradable goods. This results in real exchange rate appreciation. On the other hand, if a large share of the government expenditure is directed towards tradable goods, the relative price of non-tradable goods will fall and the real exchange rate will depreciate (Edwards, 1988a).

3. Methodology and theoretical framework

In line with previous studies on the determinants of the real exchange rate in developing nations (Baffes et al., 1997; Dosse, 2007), the major characteristics of the economy (developing) usually modeled are that of an open economy that produces and consumes two types of goods – tradable and non-tradable goods. The tradable goods are composed of importable goods and exportable goods. It is assumed that the home country consumes but does not produce importable goods, while exportable goods are produced but not consumed domestically. The total demand for non-tradable goods is composed of private sector consumption (CNP) and government consumption (CNG) on non-tradable goods.The equilibrium real exchange rate is defined as the rate that prevails when the economy is in internal and external balance simultaneously.

3.1 Internal Balance

Internal balance occurs when the market for non-tradable goods is clear. That is when:

$$y_n(R) = C_{NP} + C_{NG} = (1-\theta)RC_P + C_{NG}$$
$$R = P_T / P_N \qquad (4)$$

Where y_n is the supply of non-tradable goods at full employment, C_P is the total private spending (measured in traded goods), Θ is the share of this spending devoted to traded goods, and C_{NG} is government spending on non-traded goods.

3.2 External balance

External balance requires that changes in international reserve position (made up of current account and capita account) be zero in the long-run (Dosse,2007:59). The current account balance (CAB) is expressed as the sum of the trade balance (TB), net unilateral transfer (v), and net investment income (NIY).

The trade balance (TB) is the difference between the supply of tradable goods (Y_T(R)), and the sum of private-sector consumption on tradable goods(ΘC_P) and government spending on tradable goods (C_{TG}). Net investment income is obtained by multiplying total net foreign assets (F) by the real yield on foreign assets (r).

Given that:

$$\Delta R = CAB + NKI \quad (5)$$

In the long run ΔR=0, this means:

$$CAB = -NKI \quad (6)$$

External balance is therefore expressed as:

$$CAB = TB + v + NIY = Y_T(R_t) - (\theta C_P + C_{TG}) + v + rF = -NKI \quad (7)$$

Where NKI is the net capital inflow and all other variables are as defined above.

Setting the right hand side of equation 7 to zero, the current account balance equation becomes:

$$CAB = Y_T(R_t) - (\theta C_P + C_{TG}) + v + rF + NKI = 0 \quad (8)$$

Combining equation 4 (internal balance) and equation 8 (external balance), the real exchange rate (R_t) that ensures equilibrium in the two sectors simultaneously is given as:

$$R_t = [C_{NG}, C_{TG}, v + rF, NKI] \quad (9)$$

where, R_t is the real exchange rate, C_{NG} is the government consumption of non-tradable goods, C_{TG} is the government consumption of tradable goods, v is the net unilateral transfers, rf is the net investment income(return on foreign assets multiply by net foreign assets) and NKI represents net capital inflow.

According to Jimoh (2006), the return on foreign assets(r) can be negligible for a country like Nigeria, because (F) is small. But for simplicity the variable (v) is removed. Thus, equation 9 is expressed as:

$$R_t = [C_{NG}, C_{TG}, NKI] \tag{10}$$

Incorporating the role of terms of trade and trade policies on real exchange rate, the expression is given as:

$$R_t = \left[C_{NG}, C_{TG}, NKI, P_x^* / P_m^*, t_x, t_m \right] \tag{11}$$

where, P^*_x/P^*_m is the terms of trade (captured by crude oil price at international market), t_x is export tax and t_m is the import tax. All other variable are as defined before.

The literature (Dosse, 2007) further stated that, due to non availability of data on some of the above fundamentals, acceptable proxies are used. For instance, t_x and t_m are proxy for by openness of the economy (OPEN), the combination of C_{NG} and C_{TG} are proxy for by total government expenditure (g_n).

In such a situation, the real exchange rate (equation 11) can be expanded to incorporate all these modifications and this is written as follows:

$$R_t = \left[g_n, NKI, P_x^* / P_m^*, OPEN \right] \tag{12}$$

where τ is the variable capturing productivity differentials, all other variables as defined before.

On a final note for this framework, the work of Jimoh (2006) included among other fundamentals of the real exchange rate, the variable of monetary shocks (M2) and the lagged of nominal effective exchange rate(e_{t-1}) to determine the expression for real effective exchange rate in the short-run. This is stated as:

$$R_t^* = \left[g_n, NKI, P_x^* / P_m^*, OPEN, M_2, e_{t-1} \right] \tag{13}$$

where, R* is the real effective exchange rate over time, M_2 is the broad money and e_{t-1} is the lagged of nominal effective exchange rate. All other variables are as defined before.

3.3 Estimation Techniques

As a pre-whitening process, this study adopts a log-linear transformation of the long-run equation. Thus, equation 13 is written as:

$$LogR_t = \alpha' H_t + \mu_t \tag{14}$$

Where H_t is the vector of the values for the fundamentals, μ_t is the disturbance term. According to the theory, the shocks that cause the exchange rate to diverge from its equilibrium in the short-run should produce eventual convergence to the relationship. A specification that captures this notion is the dynamic error correction model. This thus, expresses equation 13as follows:

$$\Delta LogR_t = \theta\left(\log R_{t-1} - \alpha' H_{t-1}\right) + \sum_{i=1}^{p} \beta_i \Delta LogR_{t-i} + \sum_{i=0}^{p} \eta_i' \Delta H_{t-j} + \nu_t \tag{15}$$

where $H_t = \left[g_n, NKI, P_x^* / P_m^*, OPEN \right]$ is the vector of fundamentals, and v_t is the error term with mean zero and stationary over time. However, in the short-run variables such as broad money supply (M2) and one period lagged value (e_{t-1}) of nominal effective exchange rate are usually included in the estimation of equation 15.

The study estimates equation 15 by first testing for the unit root properties of all variables using ADF statistic, then, test for the existence of co-integration relationship between the set of fundamentals and the real effective exchange rate using the Johansen co-integration approach.

The study then estimates the co-integrated equation using the Johansen's maximum-likelihood methodology. Criteria such as; Alkaike information criteria (AIC), Schwatz criteria (SC) and Likelihood ratio (LR) are used to determine the optimal lag-length of variables of the model.

In addition, the study included in its estimation of equation 15 appropriate dummies that may account for possible shocks to the real effective exchange rate in the short-run and shifts in the intercept parameter. Three dummies were included; the first two major dummies included are the Structural Adjustment Programme (SAP) and June 12 crisis dummies. The SAP dummy is expected to account for the structural adjustment programme's shock of 1986/87 while june12 crisis dummy indicates the effect of various crises associated with transition to civil rule

between 1992 and 1994. The choice of these two dummies (SAP and June12 crisis) were guided from the work of Jimoh (2006) where it was observed that the two dummies constitutes significant shocks to the real effective exchange rate in Nigeria between the year 1960 and 2000. SAP dummy takes the value of one in 1986-1987 and zeros otherwise while June12 crisis takes the value of ones in 1992-1994 and zeros otherwise. The third dummy included is the transition to civil rule shocks in 1999 after a long period of military ruling of the country. Thus, the civil rule dummy takes a value of one in 1979- 1983 also 1999-2015 and zeros otherwise.

3.4 Definitions of Selected variables and Measurements

The Nominal Effective Exchange Rate (NEER): This is measured as the weighted average of all bilateral exchange rates between Nigeria and its 17 selected trade partners. This study uses 1960, the starting period of the study, as the base year and the computation take cognizance of US dollar to which all countries currencies are related. In this study, NEER is computed as follows:

$$NEER_t = \left[\frac{r_j}{r_{jo}} - \sum_{i=1}^{17} w_i \frac{(E_i - E_{i0})}{E_{i0}}\right] * r_{jo} \tag{16}$$

where:

r_j = nominal exchange rate (N/$)
r_{j0} = N/$ in the base period (1960)
E_i = Bilateral exchange rate of each trade partner per US dollar
E_{io} = Bilateral exchange rate in the base period (1960)
w_i = weight attached to each trade partner

In order to convert the above formula to index, equation 16 is written as follows:

$$NEER_t = \left[\frac{r_j}{r_{jo}} - \sum_{i=1}^{17} w_i \frac{(E_i - E_{i0})}{E_{i0}}\right] * 100 \tag{17}$$

All variables are as defined before for equation 16.

The real effective exchange rate (REER): This is measured as the nominal effective exchange rate adjusted for relative price differentials between Nigeria and its major trading partners. In this study the arithmetic weighted average method is employed, this is due to its relative simplicity and it application by various authors in the field. Symbolically it defined as follows:

$$REER_t = \left[NEER_t + \sum_{i=1}^{17} w_i \frac{(P_i^* - P_{i0}^*)}{(P_j - P_{j0})}\right] * r_{j0} \tag{18}$$

where:

$NEER_t$ = Nominal effective exchange rate over time
$REER_t$ = Real effective exchange rate over time
P_i^* = Trade partner's price index (CPI)
P_{i0} = Trade partner's price index in the base period (1960)
P_j = Nigeria's consumer price index (CPI)
P_{j0} = Nigeria's consumer price index in the base period (1960)

In order to convert the above formula to index, equation 18 is written as follows:

$$REER_t = \left[NEER_t + \sum_{i=1}^{17} w_i \frac{(P_i^* - P_{i0}^*)}{(P_j - P_{j0})}\right] * 100 \quad (19)$$

All variables are as defined for equation 18.

The formula used for calculating the trade weights is given as follows:

$$w_{it} = \frac{M_{it} + X_{it}}{\sum_{i=1}^{n} X_{it} + \sum_{i=1}^{n} M_{it}} \quad (20)$$

where:

w_{it} = time varying weight of country i in the overall trade volume of the country.
M_{it} = imports of Nigeria from country i at time t
X_{it} = exports of Nigeria to country i at time t
$\sum_{i=1}^{17} X_{it}$ = Exports of Nigeria to the 17 selected trading partners at time t
$\sum_{i=1}^{17} M_{it}$ = Imports of Nigeria from the 17 selected trading partners at time t.

Choice of Trade Partners: In computing Nigeria's exchange rate indices, the study used data from 17 countries; United States, India, Spain, France, Italy, Brazil, Netherlands, China, Germany, United Kingdom, Belgium, Japan, Denmark, Norway, Sweden, Canada and Switzerland. The choice of trade partner countries was guided by the fact that these countries accounted for at least 80 per cent of trade with Nigeria within the period of study (IMF direction of trade statistics).

Term of trade (P^*_x/P^*_m): The variable used in this study is the crude oil prices at different periods of analysis. This is used because oil and gas constitute the bulk of the country's export. The implication of this is that, most of the variation in Nigeria's terms of trade will corresponds to changes in world oil prices. The country is thus vulnerable to external shocks in the price of oil.

Openness of the economy (OPEN): This is measured as a ratio of exports and imports to GDP. The variable serves as a proxy of trade policies. Trade protection leads to higher domestic prices and a more appreciated real exchange rate index.

3.5 Data source

The external data especially those of Nigeria's major trading partners were obtained from International Financial Statistics (IFS) and IMF direction of trade statistics. Data used to obtain the terms of trade were also sourced from (IFS). All other data are sourced from the Central Bank of Nigeria Statistical Bulletin (various issues).

4.Results

This section present and discuss the results of all tests and regression equation of 13. It starts with the presentations of unit root and co-integration tests.

Table 1. ADF unit root test

Exogenous: Constant

Variable	Level	1st Diff	Decision
log (real effective exchange rate - REER)	-1.7639	-14.8436*	I (1)
log (openness of the economy - OPEN)	-2.2399	-10.1637*	I (1)
log (total govt. expenditure - TGE)	-1.5691	-8.0051**	I (1)
log (broad money supply – M2)	0.5009	-6.4681**	I (1)
log (terms of trade - TT)	-1.0759	-6.4835**	I (1)
log (nom. effective exchange rate - NEER)	-2.3049	-6.7784*	I (1)
log (net capital flow - NKI)	-1.1889	-13.3132*	I (1)

Critical: 1% = -4.16115% = -3.5164
10% = -3.1830

The result of the unit root tests as shown in Table 1 indicates that all variables are not stationary at levels. Thus, variables such as logREER, logTT, logOPEN, logTGE, logM2, logNEER and NKF were confirmed to be I(1). Following this result, the study is prompted to test for co-

integration between the dependent variable and those variables that were integrated of order one. The result is presented in Tables 2 and 3.

Table 2. Unrestricted co-integration rank test

Lag interval (in first differences): 1 to 1

Hypothesized No of CE(s) (Null Hyp)	Eigen value	Trace statistic	0.05 Critical value
r = 0	0.88	239.73	187.47
r ≤ 1	0.64	138.86	150.56
r ≤ 2	0.47	89.78	117.71
r ≤ 3	0.33	60.24	88.80
r ≤ 4	0.27	41.17	63.88
r ≤ 5	0.25	26.35	42.915
r ≤ 1	0.88	239.73	187.47

Trace test indicates 1 co-integrating equation at the 0.05 level

From Table 2, it could be observed that the trace statistic is significant when the unrestricted co-integration rank equal one (r=1), thus, indicating one co-integrating equation among the variables. Furthermore, the result of max-eigen value test supported the trace test. This is presented in Table 4.

Table 3. Unrestricted co-integration rank test (Max-Eigen)

Lag Interval (in first difference): 1 to 1

Null Hypothesis	Eigen value	Max-eigen statistic	0.05 Critical value
r = 0	0.88	100.86	56.71
r ≤ 1	0.64	49.08	50.55
r ≤ 2	0.47	29.53	44.49
r ≤ 3	0.33	19.06	38.33
r ≤ 4	0.27	14.83	32.12
r ≤ 5	0.25	13.98	25.82
r ≤ 1	0.88	100.86	56.71

Max-eigenvalue test indicates 1 co-integrating equation at the 0.05 level of significance.

These results confirmed a long-run relationship between Nigeria's real effective exchange rate (REER) and its major fundamentals. Having established co-integration among the I(1) variables and the existence of one co-integrating vector as confirmed by both trace statistic and max-Eigen value, an error correction model based on equation 13 was estimated in order to obtain short and long run determinants of real effective exchange rate in Nigeria.

The result of the long-run co-integration regression is presented in Table 4.

Table 4. Long-run estimates

Dependent Variable: logREER

Variable	Coefficient	t-values
Constant	42.367	-
log (openness(OPEN)(1)	0.015*	8.13
log(terms trade(TT)(1)	0.045*	5.77
log(total govt. exp(TGE)(1)	0.004*	11.32
log(net capital inflow(NKI)(1)	-0.0012*	-6.733

*** indicates significance at 1% level.**

Going by the long-run regression estimates of the Table 4 the coefficient estimates obtained corroborate the prediction of the theoretical models. All effects have the expected signs and are statistically significant. The variable openness produces a significantly depreciating effect on the real effective exchange rate, an indication that a more liberalized and open trade regime, depreciates the real effective exchange rate. Precisely, the result shows that a 5 per cent increase in the openness will lead to approximately 1.5 per cent depreciation in the real effective exchange rate. This result corroborates the outcome of Ogun (2004), Jimoh (2006) and Aliyu (2008) about the long run effect of openness of the economy on the real effective exchange rate in Nigeria. Another important variable within the model is the terms of trade which was captured by the price of crude oil. The result obtained indicates that declined terms of trade will lead to real effective exchange rate depreciation. An unfavorable terms of trade will have a negative effect on the current account balance (other things being equal), the real income of the individual decreases and less is spent on both tradable goods and non-tradable goods causing the real effective exchange rate to depreciate. According to the result, the rate of depreciation is not proportionate, for instance, a 5 per cent improvement in the terms of trade will lead to approximately 4.5 per cent depreciation of the real effective exchange rate. The

result though with different magnitude supports what was obtained in Elbadawi (1994) for some selected developing countries (Ghana, Chile and India) and the work of Ogun (2004), Jimoh (2006) for Nigeria.

Also, the total government expenditure came out positive and statistically significant at the 1per cent level. The implication of this result is that, within the period of analysis, the Nigerian government expenditures are proportionately more on imported goods and as a result an increase in such expenditures leads to real effective exchange rate depreciation. This result goes against what was obtained in the work of Edwards (1989) for selected LDCs and Elbadawi (1994) for Chile and India where he obtained for these countries an appreciation effect of government expenditure on the real effective exchange rate. Net capital inflows have been favorable to the real effective exchange rate but the extent of that effect was minute as indicated in the result of Table 4. The result is such that a 1 per cent increase in net capital inflows leads to 0.1 per cent appreciation of the exchange rate in the country. This may be as a result of the nature of major capital inflows that come to the country, most of which are into oil and gas and no tangible investment in the real sector of the economy.

The error correction estimation gives the short-run dynamic specification of the real effective exchange rate determination (equation 13). The result of this specification is presented in the Table 5:

Table 5 shows the analogous short run estimation of what is presented in the long-run regression model (Table 4). The choice of lag length (lag 1) was guided by different criteria such as LR, AIC and SC. All other statistics, such as R^2 (0.87), adjusted- R^2 (0.76) and F-statistics (14.40) show that the model is of good fit. The results evidently supported the error correction model with the coefficient of error correction term, less than one, negative and statistically significant. The coefficient obtained was 0.74 approximately. This reflects the dynamic self-correcting mechanism of the error correction model. Apart from this, the additional variables introduced in the dynamic model (broad money supply (M2) and one lagged period of nominal exchange rate) both came out positive but the coefficient of broad money proves statistically insignificant. The implication of its positive sign is that, an increase in money supply can tend to increase the price of domestic goods relatively to the imported ones, demand shift to the later, current account worsen and the real effective exchange rate depreciates. The result indicates that civil rule dummy and the June 12th crisis were significant determinants of the real effective exchange rate within the period of analysis, but, the former served as a depreciating factor while the latter leadsled to the exchange rate appreciation. SAP dummy also proves significant within the period of study. The policy also leads to the real effective exchange rate depreciation as revealed in the result.

Table 5. Short-run Vector error Correction Estimates

Dependent Variable: Δ logREER

Variable	Coefficient	t-values	Other statistics
Constant	-1.06**	-2.46	R^2 = 0.87 R^2 = 0.76 F = 14.40
Δlog(real effective exch. rate (REER)-1	-0.13	-0.63	
Δ log(openness (OPEN)-1	1.15***	1.55	
Δ log(total govt exp. (TGE)-1	0.001**	3.43	
Δ log(net capital inflow (NKI)-1	0.009	0.55	
Δ log(terms of trade (TT)-1	-10.71	-0.44	
Error correction term(-1)	-0.74*	-3.81	
Δ log(broad money)-1	0.143	0.96	
Δlog(nominal effective exchange rate (NEER)-1	0.149**	2.28	
SAP	0.362***	1.72	
Civil rule dummy	0.537**	2.43	
June12 crisis	-0.054***	-1.87	

*, **and *** denotes significance at 1%, 5% and 10% levels respectively.

Table 6. Estimates of Parsimonious Error- Correction Model

Dependent Variable: Δ logREER

Variable	Coefficient	t-values
Constant	1.94*	9.04

Δ log(openness (OPEN)-1	1.06**	2.56
Δ log(total govt exp. (TGE)-1	0.24**	2.78
Δlog(nominal effective exch rate(NEER)-1	1.65***	1.98
Error correction term(-1)	-0.81*	-4.23
SAP	0.22*	4.65
Civil rule	1.02*	3.42
June12 crisis	-0.03***	-1.77

*,**and*** implies significant at 1%,5% and 10% levels respectively
R^2= 0.89, Adjusted R^2= 0.77, F= 18.67

Table 6 indicates a more parsimonious error correction estimate of Table 5. In Table 6, the coefficient of error correction term increased (0.81) as a result of removing all variables that were not statistically significant from estimation. All other variables also prove more significant and efficient the analysis still stand.

5. Conclusion

The paper investigates the determinants of the real effective exchange rate in the Nigeria spanning from 1960 to 2015. In the study, many empirical analyses were carried out rangesranging from the computation of the real effective exchange rate itself using 17 Nigeria's trading partners to the computation of the parsimonious error correction estimates where major determinants of the subject matter were revealed. At the end, the terms of trade, the openness of the economy, net capital inflow, the total government expenditure, the nominal effective exchange rate and the three dummies employed served as major determinants of the real effective exchange rate in Nigeria between the period of 1960 and 2015. The following policy prescriptions emerges from the findings of this study:

A guided trade liberalization is needed to minimize the depreciating effects of the openness on the real effective exchange rate in the country

Since the price of oil plays a significant role in the determination of the exchange rate in Nigeria, a more realistic effort should be made towards a real diversification of the economy to avoid the continuous external shocks' effect of the fluctuations in crude oil price

Government expenditure should be directed on the investible goods and spending on imported good should be drastically reduced to avoid the danger of worsening the current account balance that may cause exchange rate depreciation

There is also the need to check the type of democracy the country is currently running as revealed in this study that the system has not been favorable to the exchange rate determination in the country.

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