Business Administration and Business Economics

Pilot Studies: Use and Misuse in South African SME Research

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Abstract: The utilization of pilot study methodology is often not in accordance with methodological principles and intentions. Further, reporting of pilot studies is reported as inadequate. The rise in the use of pilot studies in the social sciences, in particular in business research, prompts an examination of the correctness of the use of pilot study methodology in South African SME research. This article has made use of a qualitative research approach by systematically reviewing the use of pilot studies in South African SME research. Articles have been identified in prominent databases according to set inclusion and exclusion criteria. Accepted articles have then been screened according to a set of identified best practices. Findings reveal that only a small proportion of identified studies follow methodological best practices of piloting methodology. Few studies adequately report on piloting results and even fewer studies adequately describe or select a representative piloting sample. Only half of all identified studies describe the purpose for piloting. The article provides recommendations for researchers and businesses engaging in SME research and intending to utilize pilot studies.

Keywords: pilot study; systematic review; small and medium-sized enterprises; SMEs; South Africa

JEL Classification: M10; I23

1. Introduction

Pilot studies assist researchers in testing and refining methodology and processes employed prior to conducting a full-scale study. Pilot studies do this by providing the researcher with an "opportunity to practice" by allowing the researcher to address not only logistical topics such as the manner in which the study is conducted, but also substantive topics such as refining methodology. (Yin, 2011, p. 37) Sampson (2004, p. 384) notes that pilot studies hold significant benefits for researchers, yet are often misused in their application, and both incorrectly and under-reported. Additionally, few research textbooks and scientific research training cover the topic of pilot studies in sufficient detail, if at all, in order to allow

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researchers to use this tool correctl. (Thabane et al., 2010, p. 2) This apparent lack of information and training on pilot studies can therefore cause researchers to botch the application of pilot study methodology, there by providing opportunity for inefficiencies in the research process to occur. These inefficiencies can be costly, but also hold the potential of jeopardizing the process and results of the full-scale study, which is informed by data derived from pilot studies. Nunes *et al.* (2010, p. 75) describe this under-reporting of pilot studies in qualitative research as surprising, as it causes an "underdevelopment of actionable knowledge".

The correct use of pilot study methodology is therefore paramount, particularly in the social sciences, where already in the early 2000's a steady increase in the use of pilot studies has been noted. (Stebbins, 2001, p. 30) In South Africa, research into small businesses, particularly small and medium-sized enterprises (SMEs), has ballooned due to the country's difficult economic status quo, a high SME failure rate and governmental focus on promoting the growth of the SME sector. In particular, South Africa's diverse demographic profile lends itself to the use of pilot studies, as researchers need to ensure that research participants in reality understand the questions being posed and understand how participants will respond, before a full-scale study is conducted. (Quinlan et al., 2015, p. 279) The aim of this paper is to systematically review the use of pilot studies in South African research, focusing on SMEs. Based on the findings of the systematic review, the paper provides recommendations and guidelines on the correct use and reporting of pilot studies for research on South African SMEs. Findings and literature in this paper therefore provide researchers with comprehensive easy-to-use guidelines, which social scientists can use when planning and performing pilot studies.

2. Literature Review

Reviewing the methodological purpose of pilot studies allows researchers to not only utilize piloting methodology as an appropriate tool, but also allows for a deeper understanding of important piloting principles, which improve effectiveness in application of this type of methodology. The following sections firstly outline the nature of pilot studies and then describe in detail the methodological principles underpinning pilot studies by means of reviewing prominent literature in the field of piloting methodology.

2.1. Nature of Pilot Studies

A pilot study can be defined as "a smaller version of the main study used to test whether the components of the main study can all work together" (Eldridge et al., 2016, p. 2). More in-depth definitions include purpose statements of pilot studies such as being "designed to test the performance characteristics and capabilities of

study designs, measures, procedures, recruitment criteria, and operational strategies". (Moore et al., 2011, p. 332) While the term "pilot study" is commonly used, it is often also referred to as a "feasibility study", "pilot trial", "pilot work" or a "small-scale study". (Arnold et al., 2009, p. 69; Thabane et al., 2010, p. 1; Tickle-Degnen, 2013, p. 171; Eldridge et al., 2016, p. 2) Pilot studies are additionally often referred to as preliminary studies, to be conducted before a main study. (Jankowicz, 2005, p. 213) However, while the term "feasibility study" is the most commonly used synonym for the term "pilot study", the original methodological purpose of a feasibility study differs from that of a pilot study, as a feasibility study aims to gather substantive evidence, in addition to test workability of a proposed research approach, process and instrument. (Powers, 2010, p. 64; McGrath, 2013, p. 282) The primary goal of pilot studies is to test the feasibility or acceptability of study designs or methods (McGrath, 2013, p. 281), before embarking on a full-scale study with potentially disastrous consequences such as invalidating the results of a large study. (Thabane et al., 2010, p. 1) Paradoxically, researchers display a tendency to avoid pilot studies due to time and financial pressures, thereby creating the opportunity for procedural, methodological and structural errors to remain uncovered until the main research is completed, often rendering the results useless. (Crawford in Callahan, 2009) This is especially concerning, considering that the use of pilot studies is rapidly increasing, which can largely be attributed to the rise in quantitative research in the social sciences, requiring refinement in procedure and reduction in possible errors. (Stebbins, 2001, p. 30) Furthermore, pilot studies hold significant value for both qualitative and quantitative research, offering empirical leverag (Nunes et al., 2010, p. 75) Jupp (2006, p. 112) further argues that in the social sciences, "exploratory research has become synonymous with the notion of feasibility study or pilot study".

There, however, seems to still exist confusion with regard to the purpose of pilot studies, with some authors suggesting using pilot studies to develop data collection instruments (Clow & James, 2014, p. 28), while a large number of authors suggest the purpose of pilot studies to be feasibility testing. (Ellram, 1996; Powers, 2010; Thabane et al., 2010) Pilot studies hold a number of benefits such as allowing the researcher to practice interview techniques in order to improve effectiveness of time-restricted interviews. Additionally, a pilot study allows a researcher to streamline techniques for collecting field observation notes. Data analysis techniques can also be practiced and refined (Given, 2008, p. 626). Pilot studies can also allow a researcher to determine whether a chosen sampling frame is relevant or even feasible, thereby also providing a researcher with "an audit trail" (Nunes et al., 2010, p. 75).

2.2. Methodological Principles of Pilot Studies

Pilot studies are often reported on in research papers solely for the purpose of justifying the methods employed such as the overall research design or validity and reliability of the instrument, with practical problems often remaining unreported. The potential that pilot studies hold is therefore underutilized and ignored. (van Teijlingen et al., 2001, p. 289) A number of authors have attempted to define the primary aims and principles of pilot studies, yet there seems to still exist a lack of clear consensus among academics. Jankowicz (2005, p. 250) summarises the purpose of piloting is to establish whether: research design, methodology and approach will answer the research question data collection techniques are suitable in terms of practicality such as participants' ability to respond, viability in analysing large volumes of data, ability to infer from the data instructions and wording of the instrument are understandable responses can be recorded (in case of interviews) data analysis techniques will provide desired information in a presentable format findings are informative in a planned manner of reporting Thabane *et al.* (2010, p. 4) suggest classifying primary aims of conducting pilot studies under the headings *process* (evaluating feasibility of research process), *resources* (assessing potential resource constraints), *management* (determining potential human and data management problems) and *scientific* (assessment of impact on pilot participants). As these guidelines have been developed for use in the medical field, the primary aims and principles of pilot studies can be adapted for the social sciences with guidelines developed by Kelly and Denney. (1969, pp. 48-49) These are formulated under the headings *purpose*, *process*, *outcomes* and *data set*. A summary of principles and intended purpose of pilot studies is outlined in Table 1.

Table 1. Summary of piloting principles

Piloting intentions	Example
Purpose	Stated as determining feasibility of full-scale study
	Pilot results inform decisions for full-scale study
Management	Replicating the main study in terms of population representativeness
	Test procedural elements such as sampling approach and data analysis technique
	Test practicality, understandability, usability and recording of data collection instrument
	Alert research to procedural or conceptual errors and difficulties
Outcomes and Reporting	Reporting includes reason for undertaking pilot and subsequent full-scale study
	No hypothesis testing
	Clearly defined goals and objectives

	Pilot results not included in full-scale study data, except where no modifications to methodology and identical sample frame
Data Set	Participants derived from same sample frame as the intended main study
	Participants not included in the primary, full-scale study
	Sample size calculation included

Source: Adapted from Thabane et al. (2010, p. 4); Kelly & Denney (1969, pp. 48-49)

Purpose: The overarching purpose of pilot studies is to determine feasibility of a main study, prior to it being conducted. (Hazzi & Maldaon, 2015, p. 52; Kannan & Gowri, 2015, p. 208) It is therefore imperative that a pilot study be conducted before a main study, as the reporting of the results of the pilot study aim to inform decisions in the main study. (Kelly & Denney, 1969, p. 48; McGrath, 2013, p. 281) In addition, pilot studies allow both content and procedure to be refined before pretesting occurs, should pretesting be defined in the research process. (Ellram, 1996) It is important to highlight that, in case study research, piloting may not be used to build theory and to test hypothesis, but rather to use the results of the pilot study to prepare for a potentially larger, future study. (Atkinson & Delamont, 2011, p. 221)

Management: In surveys, pilot testing is strongly recommended and considered a trial run, with the aim of replicating the main study in terms of population representativeness, sampling approach and data analysis technique. A sample is therefore drawn from the target population and analyzed in the same manner as the intended study; however, the results are omitted from final analysis. (Gordon, 2016, p. 129) Pilot studies also aim to not only test, but also trial the use and process of a data collection method such as a survey or interview. The process of applying the data collection instrument, its usability and understandability is tested, as well as the ease and practicality of recording data are trialed. (Jankowicz, 2005, p. 250) The purpose of piloting methodology in interviews is to determine whether questions are answerable and relevant, and further alert the researcher to potential problems prior to data collection for the main study. (Gordon, 2016, p. 41).

Outcomes and Reporting: Reporting of pilot study results should include the reason for undertaking the pilot study, as well as the reasons for pursuing the primary study based on the results of the pilot. In practice, this involves having a clearly defined set of aims and objectives, tailored to each pilot, thereby also ensuring "methodological rigor and scientific validity". (Lancaster et al., 2004, p. 311) Other authors suggest that, in order to achieve and increase participant buy-in into a pilot study, participants should be provided with a written report post-pilot, should such a request be made. (Yin, 2011, p. 37) In addition, sample sizes in pilot studies are generally quite small, thereby not allowing reliable statistical analysis of the results (Thabane et al., 2010, p. 3). Hypothesis testing should be avoided, as the sample

sizes in pilot studies are often not significant enough to form firm conclusions. The null hypothesis for a pilot study should not replicate that of the main study, but should be specified as in the realm of "a definitive main study need not be performed" or "that there are no feasibility problems". (Duan, 2013, p. 3; Kannan & Gowri, 2015, p. 209) Lastly, results from pilot interviews should not be used in final analysis (Gordon, 2016, p. 41), except in cases where the sampling frame and methodology have not been modified post-pilot. (Thabane et al., 2010, p. 6)

Data Set: Participants in a pilot study should be derived from the same sample frame as the intended main study in order to ensure representativeness. (Lancaster et al*.,* 2004, p. 308) A sample size of 10-20% is generally acceptable and considered reasonable for conducting a pilot study (Baker, 1994), with other authors suggesting a minimum of 30 participants for non-statistical conclusions to be derived. (Lancaster et al*.,* 2004, p. 308) While a specific sample size is debatable, it is important for pilot studies to include a sample size calculation in order to justify the chosen sample. (Kannan & Gowri, 2015, p. 209) Participants of pilot studies should not later be included in the primary, full-scale study, as the "decision to proceed with the main study would not be made independently of the results of the pilot study". (Lancaster et al., 2004, p. 311)

3. Research Methodology

The study followed a descriptive research design in the form of employing systematic reviews, aiming to qualitatively assess the manner and correctness of the use of pilot studies in SME research in South Africa. Systematic reviews usually "involve identifying, synthesising and assessing all available evidence, quantitative and/or qualitative, in order to generate a robust, empirically derived answer to a focused research question". (Mallett et al., 2012, p. 445) A systematic review can thus be regarded as a fundamentally different technique from conventional or narrative reviews, in that a systematic review follows predetermined steps in discovering relevant studies in a specific subject field in order to achieve an unbiased search and selection procedure and outcome. (Sánchez-González et al., 2010, p. 116) This technique is usually employed to ensure scientific rigour, objectivity, replicability and completeness of search. (Cassell & Lee, 2011, p. 128) A set of inclusion and exclusion criteria were developed before embarking on the systematic reviews. Inclusion criteria included the study having been performed in South Africa, SMEs included; pilot study methodology employed at some stage of the research and results reported in English. Studies were excluded, which met the following criteria: study conducted outside of South Africa; reported in a language other than English and studies employing a non-business research focus.

3.1. Research Question

The primary research question underpinning the systematic review is: "Do pilot studies utilized in South African SME research achieve methodological correctness of pilot study methodology?" A list of keywords was developed in order to address the research question. Keywords included "pilot study", "pilot studies", "research", "small and medium-sized enterprises", "small, micro and medium-sized enterprises", "SME", "SMME" and "South Africa". Keywords were developed in order to discover studies conducted in South Africa, and of South African organisations, which have utilized pilot study methodology to some extent. The purpose of the study was therefore to deduce not only how frequently pilot studies are utilized in SME research in South Africa, but also if pilot studies are utilized and reported correctly. The study therefore allows guidelines to be developed in the use of pilot studies in SME research, based on observations made in past studies.

3.2. Source Selection

The study utilized a Boolean search by utilizing the keywords as presented in the previous section. Boolean operators were utilized and had to be adapted for use in relevant databases; however, the most frequently used search string was as follows: ("pilot study" OR "pilot studies" OR "feasibility study" OR "feasibility studies" OR "preliminary study" OR "preliminary studies" OR "small-scale study" OR "small-scale studies") AND ("small business" OR "small and medium-sized enterprises" OR "small, micro and medium-sized enterprises" OR "SME" OR "SMME") AND ("South Africa"). The following databases were searched in order to discover relevant studies: Ebscohost; Emerald; Proquest; Springerlink; Sabinet African Electronic Publications (SAePublications), including African Journal Archive and Gale Business Insights: Global. Due to the diverse and wide-ranging nature of the underlying journals in each database, the original Boolean search could not be utilized in its original form for each database, but had to be adapted with the help of an expert librarian, where required. The chosen keywords could appear in the article title, text, abstract or keywords.

3.3. Study Selection

The researchers reviewed all titles, abstracts, text and keywords of each identified article obtained through the database searches. No specific date range was set in order to achieve a comprehensive view of the use of pilot studies. The date ranges utilized followed the minimum and maximum date ranges provided by each database. Articles were screened in terms of the set inclusion and exclusion criteria. Those articles, which met the inclusion criteria, were accepted for full review. Those studies not meeting the inclusion criteria or exhibiting some exclusion criteria were removed from further screening. Articles were excluded from further screening where only abstracts were available, as these could not be reliably analysed. Articles accepted for full review were analyzed according to a set of

assessment criteria developed from pilot study methodology literature. The assessment criteria are presented in the following section.

3.4. Study Quality Assessment

The quality and adherence to pilot study methodology were assessed by means of criteria identified in the literature review. The identified principles and best practices were used to define the ontology of pilot studies. The ontology of pilot studies should meet the following criteria:

Purpose: Stated purpose of the pilot study is to test methodological (including instrument) and procedural feasibility prior to full-scale study.

Management: Piloting involved an effort to imitate and test methodology, instrument or processes to be used in a full-scale study.

Outcomes and reporting: Results of the pilot stated. Reporting of results include items such as construct answerability and relevance. Does the pilot study inform the research of any potential problem prior to full-scale data collection?

Data set: Composition of piloting sample representative of full-scale study sample. Collected data not utilised in primary study.

Each article passing initial screening as described in Section 3.3 was evaluated against the best practice criteria identified above. The criteria thus allow researchers to test correctness of use of the pilot study methodology.

3.5. Data Abstraction

Data of all identified articles was entered into a spreadsheet and summarised in table format. The table contained the following headings: Database Name, Date of Search, Date Range, Articles Discovered, Not Accepted (Irrelevant) Articles and Accepted (Relevant) Articles. Screening results from accepted articles were captured per article in table format according to the criteria identified in Section 3.4. Further analysis of the detailed screening table was then presented in table format.

4. Findings

4.1. Overview of the Research Process

Initial database searches yielded 686 studies being discovered during the first stage of the search. After considering the inclusion and exclusion criteria, 648 studies (94.5%) were excluded from further analysis. Primary reasons for exclusion of the 648 articles ranged from studies being conducted outside of South Africa, SMEs not being included in the study and only abstracts being available. A total of 38 studies (5.5%) were therefore accepted (included) for review. Following a high-

level analysis of the accepted articles, four articles were discarded as they were duplicates of other discovered and accepted (relevant) studies. Therefore, a total of 34 full-text relevant articles (4.96%) were accepted for in-depth review against the set criteria. The results of the initial screening per database are outlined in Table 2.

Table 2. Preliminary results of systematic review

Database	Date of search	Date range	Discovered (Stage 1)	Not Accepted (Stage 2)	Accepted (Stage 2)
Ebscohost	2 September 2016	1886-2016	17	14	3
Emerald	2 September 2016	1898-2016	132	129	3
Springerlink	5 September 2016	1996-2016	80	80	0
Proquest	12 September 2016	1969-2016	169	154	15
Sabinet SAepublications	7 September 2016	1990-2016	264	248	16
Gale Business Insights: Global	12 September 2016	1980-2016	24	23	1
Primary Totals			**686**	**648**	**38**
Less Duplicates					**4**
Net Total					**34**

Source: Author's compilation

4.2. Evaluation of accepted articles

A second, more detailed analysis of each study was performed. An evaluation was performed again the identified criteria. Overall analysis of research findings (Table 3) reveal that of the 34 identified studies, only seven (7) studies (20.6%) adhere to all set methodological best practices of pilot studies. Of the remaining 27 studies, 11 (32.4%) do not adhere to the pilot study methodology at all. The remaining studies adhere to some of the set criteria. Further analysis of each criteria reveals that, in particular, 50% of identified studies clearly state the **purpose** of utilizing pilot study methodology. 41.2% incorrectly state the purpose of piloting, with 8.8% not stating a purpose for piloting at all. Findings from the **management** aspect of the piloting process reveal that 12 of the studies (35.3%) adequately have utilized piloting methodology to imitate or test sampling processes, instruments or study methodology. Seven (7) studies (20.6%) do not describe which aspect of the relevant studies has been tested. The remaining 13 studies (38.2%) utilize pilot study methodology for some purpose other than testing or imitating procedural or methodological aspect of the respective studies. In terms of the statement of **outcomes and reporting of results**, 41.2% of identified studies adequately report outcomes of the pilot. 38.2% of identified studies report the outcomes incorrectly or inadequately, with the remaining 20.6% not reporting results at all. Lastly, an analysis of the included **data set** reveals that 35.3% of identified studies outline details and size of the included data set, with the remainder (64.7%) either not

describing the piloting sample at all (20.6%), or utilizing a sample that is not representative of the population (44.1%), for example drawing a sample from an unrelated population.

Table 3. Summary of systematic review of accepted articles

Criteria adherence	Purpose		Management		Outcomes & Reporting		Data Set	
	#	%	#	%	#	%	#	%
✓	17	50	12	35.3	14	41.2	12	35.3
✗	14	41.2	15	44.1	13	38.2	15	44.1
n.d.	3	8.8	7	20.6	7	20.6	7	20.6
	34		**34**		**34**		**34**	
	#	%	Cum. %					
Non-adherence to any criteria	11	32.4	32.4					
Adherence to 1 criteria	6	17.6	50.0					
Adherence to 2 criteria	9	26.5	76.5					
Adherence to 3 criteria	1	2.9	79.4					
Adherence to all criteria	7	20.6	100					
	34	**100**						

Source: Author's compilation

4.3. Discussion of Findings

Given the magnitude of SME research being conducted in South Africa, it is surprising that few studies make use of piloting methodology, particularly when considering the sample sizes involved in SME research. These findings, however, could be attributed to piloting methodology still growing in popularity in research in the social sciences. Therefore, there seems to exist a status quo of underutilization of pilot study methodology in SME research in South Africa in particular.

While pilot study methodology does not seem to be extensively utilized in SME research when considering the findings, it is more concerning that an overview of criteria adherence shows that only a small proportion (20.6%) of studies adhere to the developed criteria. It is further worrying that 32.4% of the identified studies do not adhere to piloting methodology at all, therefore possibly nullifying the piloting efforts of the relevant authors. In terms of identified studies stating the purpose of performing a pilot study, only half (50%) of the studies adequately state and identify the reason for piloting. The remaining studies either do not state the reason for piloting at all (8.8%), or state an inadequate or methodologically incorrect reason (41.2%). This means that a large proportion of the studies perform piloting

for a reason other than testing feasibility of process, methodology or instrument. In particular, four of the studies making reference to pilot methodology explicitly label themselves as being small-scale studies, small exploratory studies, preliminary or case studies, while others merely state that the sample frame was small and the study can "therefore can be viewed as a pilot". A further study labeled itself as a combined pre-test and small-scale exploratory study. The findings of the systematic review seem to confirm some of the concerns raised in recent literature around the incorrect use and reporting of pilot studies. In terms of reporting results of piloting efforts, 20.6% of sampled studies do not report results at all, while 38.2% inadequately report findings, the most common culprit being not reporting the impact the pilot had on the full-scale study instrument, process or methodology. Just under half (41.2%) of identified studies report in some manner on how the pilot has influenced the research, with changes in instrument construct and answerability being the most commonly reported outcomes. This indicates that the majority of studies (58.8%) have utilized time and resources to perform a pilot project, yet have not utilized the opportunity to report the findings adequately, if at all.

An examination of the "management" criteria revealed that only 35.3% of the studies performed and described activities during the pilot that were aimed at testing procedural, methodological or practical elements of the study. Another 44.1% of studies performed activities that were not part of pilot study methodology, most commonly performing items intended for the primary study such as data collection, testing hypothesis or statistically testing reliability and validity of the data collection instrument. The remainder of the studies (20.6%) did not describe which tasks were performed during the piloting phase. Viewed in conjunction with the purpose statements of each pilot, the implementation is concerning as it does not match the intended purpose. This means that tasks have been performed which do not aid in testing feasibility of the primary study, which detracts from the intended impact of the pilot. Further analysis of the reported data set of each identified study shows that only a small proportion (35.3%) of studies have utilized a study sample for the pilot that is reflective of the full-scale study population and reported it as such. Of the studies conducted, 44.1% have used a sample for the pilot that is not representative of the population, in most cases this taking the form of choosing a sample that does not reflect the population characteristics of the full-scale study such as utilizing other academics or postgraduate students to test answerability of the data collection instrument. Another 20.6% of studies do not describe the sample composition at all. None of the identified studies perform a sample size calculation or state the sample representativeness quantitatively. These findings are of concern as choosing a sample substantially different from the target population, or providing inadequate information on the piloting sample characteristics does not adequately prepare

researchers for issues that might be encountered during data collection in the primary study.

5. Conclusion

Pilot studies allow researchers to test feasibility and methodology of a larger study prior to it being conducted. Pilot studies thus carry substantial benefits for researchers and business alike. The rise in the use of pilot methodology in the social sciences is testimony to the importance that pilot studies hold. Pilot studies carry significant importance in research conducted for the business sector, as it allows business to avoid unanticipated errors, which are often costly, thereby improving both efficiency and effectiveness of business research. Further, it allows businesses to decide whether a full-scale project is worth pursuing, thereby providing funding bodies with the necessary data to decide on quantitative feasibility of business research. (Hazzi & Maldaon, 2015, pp. 59-60) The aim of this article was thus to systematically and objectively review the use of pilot studies in SME research in South Africa. The article aimed to assess whether South African studies, which have utilized pilot studies, employed pilot study methodology correctly, and if the results from the conducted pilot studies were adequately reported. The findings of this study show that, in-line with concerns raised in literature, pilot study methodology is, in an overwhelming number of analyzed cases, not utilized and reported appropriately. A large number of studies further do not state the purpose of performing piloting methods. The lack of reporting results of pilot studies creates a gap in literature, as important research findings are not reported on, some of which may hold substantial benefits for other researchers or the scientific community. The majority of identified studies merely make fleeting reference to the results of the pilot, thereby not informing the reader of the benefits and impact the pilot has on the primary study. Also, utilizing a data set that is not representative of the primary study's population defeats the purpose of performing a pilot, as the target population's interpretation and perception of the instrument and process cannot be gauged accurately.

Considering the results of the systematic review, it is recommended that SME researchers in South Africa familiarize themselves with the methodological purpose of pilot studies. Further, the lack of coverage of pilot study methodology in academic research textbooks perpetuates the lack of awareness around this type of methodology. It is therefore recommended that pilot study methodology receives increased and improved coverage, in an easy-to-use format, in popular research textbooks. Also, a need exists to raise awareness with SME researchers in South Africa around the benefits that pilot study methodology holds when applied correctly.

6. Managerial Implications and Recommendations for Future Research

The research clarifies and reiterates the purpose and appropriate application of pilot study research. The findings will assist small business researchers and research institutions to utilize pilot studies more effectively and in conformance with their intended purpose. Further, the research findings promote and simplify the use of pilot studies when testing instruments or new constructs; therefore, mitigating the need for, and tendency of, researchers to perform unnecessary full-scale studies for purposes of instrument or construct validation. The research findings will also assist researchers in preventing common pitfalls in using pilot studies such as not utilizing the findings of pilot studies as lessons and inputs for a full-scale study, as well as preventing the classification of studies with small samples as pilot studies. Lastly, the research aims to promote the use of pilot studies in the social sciences and more importantly in SME research, as pilot studies are most commonly and frequently used in the field of medical research.

Future research could be expanded to include not only investigating SMEs, but also the use of pilot methodology in all South African business research. This would provide a comprehensive overview of piloting efforts in South African business research. Further, it would be of value to investigate changes in usage patterns and correctness of piloting methodology over a defined time period. This would allow researchers to gauge the rate at which piloting methodology is growing in popularity, as well as assess whether researchers are making changes to the manner in which they utilize and report on piloting efforts.

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Environmental Issues in Internet of Things: Challenges and Solutions

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Abstract: The Internet of Things (IoT) is an emerging technology which extends the boundaries of Internet to include a wide variety of devices. However, the technologies that facilitate its implementation come with some challenges. Its effect on the environment is one of these. To reflect the interest in this field, the paradigm of green IoT is used in research and practice. In this paper, we survey state-of-the-art technologies and applications in this new area. According to previous research, the IoT is a suite of technologies that enables a connection between millions of devices and sensors. These technologies mean that more resources are used and that there is more e-waste; however, it also leads to new possibilities to help the environment and society through natural disaster prevention. Each IoT technology brings benefits by reducing the negative effects of the activities for which it is used, and by using it directly in environmental protection. We investigate the challenges of and the solutions brought about by the essential components of the IoT on the environment, in accordance with these two fields of interest.

Keywords: Internet of things; environment protection; energy efficiency; e-waste management

JEL Classification: Q55; O33

1. Introduction

The Internet of Things (IoT) is an extension of the Internet and consists of a very large number of computing devices communicating with each other to perform various tasks. The first use of the concept was in 1998, by Kevin Ashton. He said that: "The Internet of Things has the potential to change the world, just as the Internet did. Maybe even more so". (Ashton, 2009) The IoT has seen a steady growth in last decades due to the evolution of information and communication technologies (ICT). The World Wide Web has evolved rapidly from Web 1.0 to Web 2.0 and Web 3.0. However, the last generation has been one of transition to Web 4.0, which is IoT. Web 4.0 is *open and intelligent* and is about *the ultra-intelligent electronic agent.* (Fowler & Rodd, 2016) According to Perera et al. (2013), the IoT has not revolutionized people's lives or the field of computing; it is

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just another step in the evolution of the Internet. However, IoT comes with a wide variety of challenges. It is a world full of smart objects that promises to improve business processes and human lives, but it brings with it serious threats that must be solved and technical challenges that must be overcome. (Whitmore et al., 2015) Most of these challenges are in the field of data security and confidentiality. (Georgescu & Popescul, 2016) According to Miorandi et al. (2012), from a conceptual point of view, the IoT is based on *three pillars, related to the ability of smart objects to: (i) be identifiable (anything identifies itself), (ii) to communicate (anything communicates) and (iii) to interact (anything interacts) – either among themselves, building networks of interconnected objects, or with end-users or other entities in the network.* Unlike the traditional Internet, where the main producers and consumers of data and information are people, in the IoT objects generate and use the largest amount of data and information. These objects are highly varied and have different complexities. Some are small devices with limited computation capabilities, such as Radio Frequency Identification tags (RFIDs); others are very complex, such as smartphones, smart appliances and smart vehicles. Each relevant component has the potential to become proactive and self-managing. In IoT, objects are able to understand the objects in the physical world and to respond promptly to events outside of themselves.

The aim of this paper is to identify the main research challenges for the positive and negative influence of the IoT on the environment. The rest of this paper is organized as follows. Section 2 reviews the IoT, both present and future. In Section 3, the problem statement is presented. The positive and negative effects of the IoT"s development and its effect on the environment are presented in Section 4. Finally, Section 5 concludes the study.

2. Related Work

The IoT is the next step in the evolution of the Internet. People are excited about the opportunities and changes brought about by these technologies, such as smart cities, smart power grids, smart wearables, smart supply chain, etc. The development of IoT has been favoured by technological advances and by a reduction in the cost of production and the use of ICT. Its implementation involves billions of online objects that communicate and change their status according to users' preferences and environmental changes. Like any complex and growing technology, the IoT has been defined by different authors in many different ways depending on the component under consideration. Atzori et al. (2010) identified three different visions for the IoT: "Internet oriented" (middleware), "things oriented" (sensors) and "semantic oriented" (knowledge). Different definitions of the IoT, and the main technologies, concepts and standards according to these paradigms, are presented in Table 2.

Table 1. IoT paradigms

Paradigm	Definition	Technologies, concepts and standards
Internet oriented	"IoT will be deployed by means of a sort of simplification of the current IP to adapt it to any object and make those objects addressable and reachable from any location." (Atzori et al., 2010)	IP for smart objects (IPSO), WoT, Internet Ø
Things oriented	"Things" are "active participants in business, information and social processes where they are enabled to interact and communicate among themselves and with the environment by exchanging data and information "sensed" about the environment, while reacting autonomously to the "real/physical world" events and influencing it by running processes that trigger actions and create services with or without direct human intervention." (Sundmaeker et al., 2010, p. 43)	RFID, UID, NFC, WSN, Spimes, Smart Items
Semantic oriented	"The Semantic Sensor (&Actuator) Web is an extension of the current Web/Internet in which information is given well-defined meaning, better enabling objects, devices and people to work in co-operation and to also enable autonomous interactions between devices and/or objects." (Barnaghi, 2014)	Semantic Technologies, Reasoning over dynamic data, SEE

Beyond these different approaches, one of the most popular definitions is that given by Vermesan et al. (2011), who stated that the IoT "allows people and things to be connected Anytime, Anyplace, with Anything and Anyone, ideally using Any path/network and Any service". Figure 2 represents this approach.
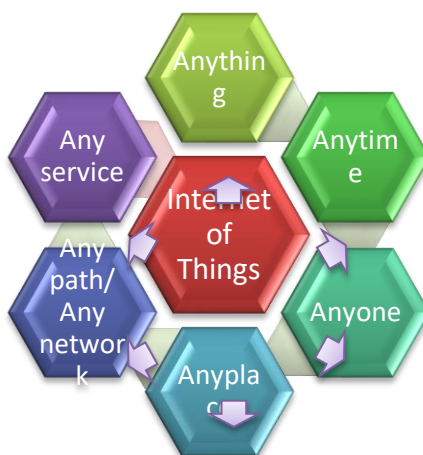

Figure 1. Definition of the IoT
Source: (Vermesan et al., 2011; Perera et al., 2014)

The IoT requires massive investment and significant changes in infrastructure, communications, interfaces, protocols and standards. (Li et al., 2015) At present, the concept is an important subject of political and economic debate, because it is expected to stimulate new business opportunities in the field of ICT and in other industries. (Ardito et al., 2017) The increase in the number of Internet connected devices supports these concerns. According to Rayn and Watson (2017), at present only 0.6% of objects have the potential to be part of the IoT, but the number of devices could be as high as 50 billion by 2020, far greater than the number of human users. Another study made by Gartner points out that the *consumer segment is the largest user of connected things* (Figure 2).
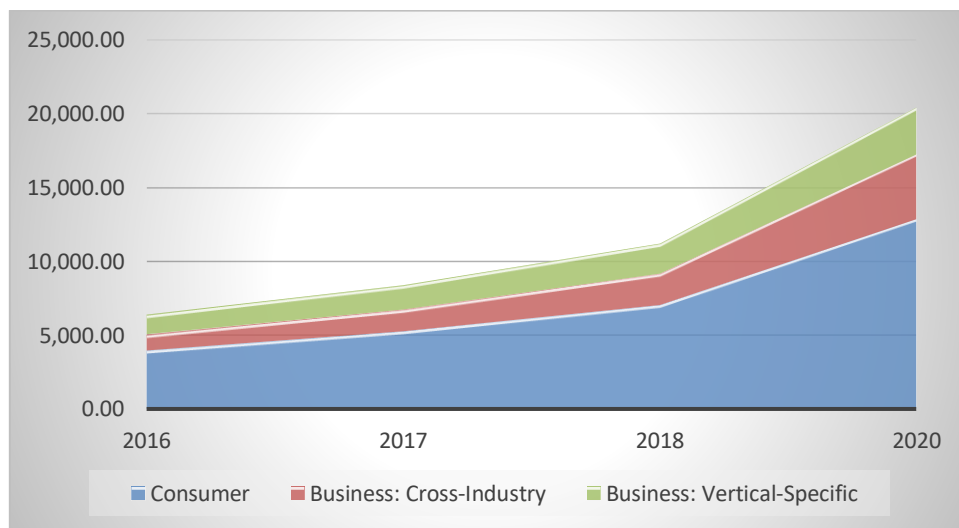

Figure 2. IoT Units Installed Base by Category (Millions of Units)

An important question is: *how environmental-friendly will these devices be?* The increasing number of devices able to communicate with each other to perform different tasks has both positive and negative effects. For the natural environment, the most important issues are increasing the volume of e-waste, energy consumption and CO_2 emissions. As a result, features like the robustness of devices and energy efficiency are very important for minimizing these influences. On the other side of positive influences, devices for monitoring airborne quality, radiation, water quality, hazardous airborne chemicals and many other environmental indicators bring significant benefits in terms of quality of life. They could be an important source of information for finding sustainable solutions to environmental issues.

3. Problem Statement

All people have a role in reducing the negative impact on the environment in both their personal and professional lives. To fulfil this role, they need to be informed and to have a favourable legal framework provided by regulatory institutions. For this reason, in economically and socially stable countries, the level of interest in environmental protection and citizens' initiatives in this direction are more representative. Neuroscientists have shown that people are addicted to information. Panksepp (2004) mentions that our brain contains a seeking system that promotes the spontaneous capacity to explore or investigate information about our world. (Watson et al., 2011) IoT has all of the features needed to meet this constant need for information and, at the same time, performs certain repetitive activities which therefore leave more time for innovation and creativity. However, the environmental impact of IoT has not received the same level of attention as its impact on social life and manufacturing.

4. Green in IoT vs. Green by IoT

The IoT has brought with it increasing opportunities and challenges for environmental protection. Similar to the relationship between the environment and ICT, the IoT can have both first and second order effects on the environment. (Berkhout & Hertin, 2001, p. 2) A first order effect is the negative impact of ICT production, use and disposal. This effect refers to the physical existence of ICT and the processes it involves. These technologies generate CO_2 emissions, e-waste and the use of harmful substances and non-renewable resources across their entire life cycle. Second order effects are related to the benefits of using ICT to improve the ecologically sustainable development of businesses and society. The contribution of the IoT to environmental protection can be bi-directional: the design and development of energy-efficient IoT devices from recyclable and biodegradable materials and the use of IoT devices to monitor the environment and prevent its degradation. However, the IoT is first and foremost ICT, and ICT has some negative influences on the environment. Nevertheless, by using them in various fields of activity, it helps to reduce the negative effects of human activities on the environment. For example, in supply chains, RFID tags contribute to reducing CO_2 emissions by optimizing flows of perishable goods, ensuring a constant temperature for storing them, tracking the recycling of plastic used by cars, improving waste management, etc. Environmental sensors are used to measure air quality, water quality and radiation level, and to detect the presence of hazardous substances in places in which they would present danger to people or to which they do not have access. The ability to protect the environment must accompany the whole life cycle of IoT technologies through green design, green production, green

utilization, and finally, green disposal/recycling so as to have no or very little impact on the environment. (Sathyamoorthy et al., 2015; Zhu et al., 2015)

The most important components and technologies of green IoT are presented in this section. We have identified two perspectives of the relationship of green IoT with the environment, similar those given by Calero and Piattini (2015) to green ICT projects:

Green by IoT are initiatives to reduce the environmental impact of operations using the IoT.

Green in IoT are initiatives to reduce the environmental impact of the IoT.

A *RIFD tag* is a very small microchip with a unique identifier that can be attached to objects, animals or people and can receive and send signals. They use radio waves to exchange information, which is read using RFID readers located at different distances depending on the tag type and the device. In Table 2, the ways in which this technology can support environmental protection are presented.

Table 2. Green by RFID vs. Green in RFID

Green by RFID	Green in RFID
Wildlife monitoring to collect environmental data, track badgers and deliver this information to geologists (Dyo et al., 2009); Waste management: automatic waste sorting into recyclable materials, restricting the access of unauthorized persons to the waste bins and monitoring the volume of waste produced by each person, etc.; Monitoring nature (e.g., trees, animals) and environmental conservations; Predicting natural disasters (e.g., volcanic eruptions).	Minimize tags to reduce the amount of non-degradable resources that they contain; Using biodegradable materials for tags; Developing and using algorithms and protocols to reduce per-tag energy consumption (Qiao et al., 2011), the number of colliding responses from tags (Namboodiri & Gao, 2007) and adjusting transmission power levels dynamically (Zhu, 2015), etc.

Wireless sensor networks (WSN) are spatially distributed autonomous sensors, which communicate with each other to monitor physical or environmental conditions. (Lee & Lee, 2015) The IoT cannot exist without sensor networks because they provide most of the hardware infrastructure support by providing access to sensors and actuators. (Perera et al., 2014) In Table 3, the ways in which WSN can support environmental protection are presented.

Table 3. Green by WSN vs. Green in WSN

Green by WSN	Green in WSN
Integration of the WSN with energy harvesters; Natural environment monitoring and risk identification (floods, tsunami, air pollution, gas, etc.); Energy monitoring in smart buildings; Traffic monitoring; Natural resource management (e.g., water, light) necessary in agriculture.	Energy savings by switching sensors to low-power operation mode when not in use; Reduction of the volume of data by technics, like network coding, compression, aggregation, etc.; Implementing energy-efficient routing protocols.

Near Field Communication (NFC) is "a radio device, on a frequency of 13.56 MHz, which can establish the communication between two objects which are in an area of up to 20 cm". (Popescul & Georgescu, 2013) Table 4 presents how NFC supports environmental protection.

Table 4. Green by NFC vs. Green in NFC

Green by NFC	Green in NFC
Optimizing the use of resources according to the presence or absence of people in a particular place (e.g., home, office, parking garage, etc.); Reducing the amount of paper by using NFC technologies to distribute information to potential consumers; Reducing the number of cards by replacing them with apps available on your smartphone.	Using recycled materials for NFC tags; Minimizing energy consumption for active NFC.

Machine-to-machine (M2M) describes "the technologies that enable computers, embedded processors, smart sensors, actuators and mobile devices to communicate with one another, take measurements and make decisions - often without human intervention". (Watson et al., 2004) Table 5 presents how M2M supports environmental protection.

Table 5. Green by M2M vs. Green in M2M

Green by M2M	Green in M2M
Monitoring energy consumption and gas/oil production; Smart Grid Monitoring in industries; Smart meters for Home Energy Management Systems (Chen, 2011); Monitoring machine health in industry; Monitoring air quality and water treatment and supply; Traffic monitoring.	Harvesting the energy capabilities of the environment; Using an efficient nodes schedule and switching to sleep mode when they are not in use; Using distributed computing techniques and developing algorithms for efficient transmission protocols.

Supervisory control and data acquisition (SCADA) is "a computer-based control system which are used to monitor and control physical processes". (Tsang, 2010) In Table 6, the ways in which this technology contributes to reducing negative impacts on the environment are presented.

Table 6. Green by SCADA vs. Green in SCADA

Green by SCADA	Green in SCADA
Optimizing resources consumed, e.g., energy, water, etc. in all production processes; Managing information on water resources in the case of floods and cleaning up after them; Managing the water reserves necessary for plants in case of drought; Environmental monitoring under extreme temperatures; Monitoring air quality, sound intensity and radiation levels.	Using recyclable materials for programmable logic controllers (PLCs) or remote terminal units (RTUs); Developing and using green software SCADA; Using the most energy-efficient hardware.

Cloud computing is "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (…) that can be rapidly provisioned and released with minimal management effort or service provider interaction". (Mell & Grace, 2009) Table 7 presents how cloud computing supports environmental protection.

Table 7. Green by cloud computing vs. Green in cloud computing

Green by cloud computing	Green in cloud computing
Using clean energy in data centres; Using energy-efficient hardware and software; Efficiently managing hardware and software resources and task schedules; Implementing power saving methods for virtual machine management.	Provides the hardware and software resources necessary for storing, processing and communicating information between the above-mentioned IoT components.

As can be seen from the previous tables, there is a wide range of hardware and software solutions for minimizing the negative effects on the environment of using IoT components. These include low energy consumption, limiting non-renewable or polluting resources in building and infrastructure and optimizing production processes across diverse fields. Considering the exponential increase in the number of connected objects expected over the next few years, the effects of these objects on the environment over their life cycle are very important. But the results of studies in this field are positive. A report done by Ericsson (2015) claims that the IoT, through smart transport (1%), smart buildings (1%), smart travel (2%), smart work (2%), smart agriculture and land use (3%), smart services/smart industry (3%) and smart grids, including smart homes (4%), could help to cut up to 63.5 Gt of GHG emissions by 2030, or a total of up to 15%.

5. The Economic Impact of Green Iot

Green IoT has economic effects both in terms of increasing and decreasing costs and revenues. Some changes can be intuited, while others will emerge in the future. According to data from Cisco Systems, IoT is poised to generate $19 trillion in economic value for businesses and society, as well as cost savings, improved citizen services and increased revenues for governments and other public-sector organizations. (Chambers, 2014) Green IoT creates new sources of revenue for developers and users and has the potential to transform following sectors of the green economy: agriculture, energy supply/renewable energy, fisheries, buildings, forestry, industry/manufacturing, tourism, transport, waste management and water. Businesses will adopt IoT solutions to improve their bottom line by lowering operating costs, increasing productivity and expanding to new markets or developing new product offerings. (Greenough, 2016) But, the IoT is essential for the smart environment. According to Carrino et al. (2016), these technologies allow reliable access to heterogeneous and distributed data and may represent a good solution for the smart cities of the future.

Even without addressing environmental issues directly, the IoT can contribute to protecting the environment through the rigorous monitoring of water and energy consumption, waste management and through intensifying efforts to reduce climate change. The IoT's capacity to increase energy efficiency with smart grids, even if less environmentally-friendly sources are used, leads to cost savings and less CO_2 emissions. In the case of water, the information it provides can help users and different objects to better plan their usage and overall water conservation. In the case of waste management, the IoT helps to measure waste levels in public bins and compact trash, in order to enhance efficiency by planning collection routes where and when pickup is needed. (Adler, 2015) In agriculture, smart farming solutions help farmers to preserve resources and to minimize costs. The IoT has the potential to prevent natural disasters, to support the rational use of water resources, to control the product quality so as not to endanger the health of consumers, etc. All of these are benefits of the IoT. Green IoT, through the development and use of energy-efficient devices, increases these environmental benefits and revenues while decreasing costs. For example, energy-autonomous devices could harvest energy from natural sources and could become energy suppliers for other devices or sub-systems. They could eliminate energy costs for themselves and for other objects.

Increasing the number of IoT devices leads to an increase in the volume of e-waste and to the growth of the e-waste management market. According to a new report from MarketsandMarkets, this market will reach $ 5.04 billion by 2020, which represents an increase of 20.6% between 2015 and 2020, from $ 1.66 million in 2014.

The integration of these objects brings with it many challenges and requires significant investments. The EU is investing €192 million in IoT research and innovation from 2014 to 2017. (European Commission, 2016) According to IDC (2017), global IoT spending will have a compound annual growth rate of 15.6% over the 2015-2020 period, reaching $1.29 trillion in 2020. But this is the price for the more than five billion people and 50 billion things connected (Chambers, 2014) and will bring a compound annual growth rate of at least at 20% over the same period. (Columbus, 2017) Implicitly, a significant percentage of these costs and revenues will lead to environmental protection actions being used for designing and developing green IoT hardware and software. Some of the investments will also be used directly for the production of green IoT devices, which will have a positive impact on the environment.

6. Conclusion

This paper analyses the two faces of green IoT: reducing the negative effects of IoT use in various fields of activity – green by IoT; and minimizing (even eliminating) the negative effects of IoT devices on the environment – green in IoT. We also presented several economic aspects of green IoT. The analysis of those two perspectives showed that the development of green IoT is a natural consequence of IoT evolution. In many cases, as exemplified in this paper, they naturally contribute to enhancing the relationship with the environment through their destinations.

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Ongoing Trends for Central Banks' Strategy

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Abstract: It is recognized that the global financial crisis, with its immediate influences, has led to major changes in the central banks' policy, but that longer-term effects have still put monetary policy strategies on important challenges related to the way in which they can be adapted to the post-crisis environment. This article aims at identifying options for the monetary policy strategy in the future, starting from highlighting the post-crisis adjustments of central banks' monetary policy. To this end, we apply the comparative analysis between central banks, both from developed countries and emerging ones. The results shows that although there is not a valid universal solution, the monetary policy strategies can be adjusted taking into account the features of both the forecast-inflation targeting strategy and the integrated inflation targeting strategy. The latter one implies to explicitly extend the central bank's responsibility by including the financial stability objective into the monetary policy strategy.

Keywords: unconventional tools; inflation expectations; nominal anchor; post-crisis period

JEL Classification: E52; E58

1. Introduction

The post-crisis period is marked by numerous challenges for macroeconomic policies, including for monetary policy. The frequent turbulences in the financial market, with their effects on the risk perception of the market participants (Lupu et al., 2016), uncertainties regarding the effects of the non-standard monetary measures, or those regarding macroeconomic perspectives, including the fear of deflation, represent at least so many challenges for the monetary policy of central banks. They are the effect of deeper imbalances reflected not only by the severity of the recession period after the global financial crisis and the subsequent persistently anaemic recovery, but also by the unbalanced post-crisis policy-mix, which has left the task to manage this burden to the monetary policy.

In the last decade, there has been a change in the position of central banks conduit,

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from an offensive one, driven by the important role played by these institutions in managing the adverse effects of the global financial crisis, to a defensive one, as an accommodation to the circumstances created by the complexity of the post-crisis challenges.

Empirically, there is a preference for the inflation targeting strategy as a monetary policy strategy of most of the central banks worldwide, this being grounded on the theoretical level, taking into account the avoidance of temporal inconsistency, the importance attached to the credibility and autonomy of the monetary authority, its focus on the formation of inflation expectations, the technical character of the pursued objective, etc.

With the global financial crisis, this strategy has often been criticized, and its strengths were questioned. The pressures came from those who considered that the inflation targeting strategy was the author of the crisis (Taylor, 2012), because it conferred a too eased character to the monetary policy by creating a favourable environment for the accumulation of imbalances in the 2000s (Borio and Lowe, 2002), but insufficient after this moment. Others, on the other hand, consider that this regime is just a "stander-by" of the crisis or even a "saviour" of the crisis (Banerjee et al., 2013), meaning that the inflation targeting strategy, by anchoring the inflationary expectations, would reduce the severity of the financial crisis effects.

The article starts from the features of the recent post-crisis period in the matter of monetary policy and from some observations on the inflation targeting strategy as a dominant monetary strategy adopted by most central banks in both developed and emerging countries. Based on the analysis of the reactions of these institutions to the problems encountered in the post-crisis period, several options are evidenced for central banks in order to respond to the new challenges. As an analysis period, the focus is on the recent post-crisis phase (after 2013), when, in most economies, the monetary policy has to manage the inflation's dynamics, persistently low (below the optimal level, the chosen target), under the difficult conditions related to a narrowed room for maneuver of the conventional monetary policy, as well as to the uncertainty about the effects of unconventional measures applied by many central banks. Given that the economic activity in many countries continues to decline, and the period of inflation under targeting is prolonged, there is a risk of affecting inflation expectations. In addition, many central banks operate in an environment of minimum interest rates, which may affect the credibility of the return strategy to the medium-term inflation target for anchoring inflationary expectations, another challenge for the monetary policy being the decreased sensitivity of these expectations to inflation surprises. The unconventional monetary policy measures adopted after the global financial crisis triggered the inflationary expectations (Cloyne et al., 2016; Hofmann & Zhu, 2013), but they

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gradually decreased, which may indicate that the more recent monetary policy would have been less adaptable than thought.

2. Remarks on the Post-Crisis Monetary Policy Adjustments

Although there is no consensus on the generally favourable nature of the inflation targeting strategy (Reichlin & Baldwin, 2013), the recent experience of central banks shows that it remains a valid one in the post-crisis period. The success and credibility of the inflation targeting regime gained before the global financial crisis outbreak, created a large enough space for central banks to act aggressively during the crisis to stimulate the economies they represented by a series of countermeasures for the threats to the stability of the financial system (reduction of monetary policy interest rates, monetary and quantitative easing measures, foreign exchange swap operations, reduction of minimum reserves, etc.). The monetary policy framework, characterized by a high level of transparency, has ensured clearer communication of the decision-making motivations.

2.1. Nominal Anchor and Monetary Policy Objective

Medium-term inflation expectations that tend to decrease in the post-crisis period call for a more aggressive monetary policy approach. A credible and transparent arrangement in the direction of a temporary increasing of the inflation target level, but not too high, could provide an important condition for counteracting the deflation and recession risks by long-term reduction of real rates, even when nominal interest rates are at the minimum level (zero lower bond). This would lead to a revival of the demand and a return of the inflation rate at the target level, in a shorter time. Based on this reasoning, more and more central banks recognize the importance of the medium-term flexible inflation targeting strategy of some central banks (e.g. Australia) by allowing short-term inflation fluctuations. The target flexibility involves overtaking it in one way or another, facilitating the anchoring of the inflationary expectations in the medium term and reducing the uncertainty in the economy. In this context, the monetary policy option is aimed at pursuing the faster rise in inflation, with the expectation that it will mean a temporary overrun of inflation, and in the future the target will be pursued to be attained from that higher level. The Bank of Japan has such a strategy and the expected effect would be to improve the debt dynamics by boosting the nominal GDP and reducing debt levels as a share of GDP.

Some studies (Blanchard et al., 2010; Krugman, 2014) propose the shifting of the inflation target above 2% level, as an option to change the inflation target, thus giving the central bank the opportunity to introduce more incentives when needed. In theory, moving the inflation target to a higher level would reduce the constraints on the minimum interest rate threshold, but the benefits of a greater flexibility

could be overcome or even eliminated by the risks of rising inflationary volatility (Kryvtsov & Mendes, 2015), and "de-anchoring" of the inflationary expectations, thus increasing the risk of affecting the credibility of the central bank if the long-term targets are abandoned.

The analysis based on the annual reports of central banks indicates overall the maintenance of the nominal anchors and monetary policy objectives. The monetary policy adaptation in the post-crisis period was only slightly reflected in changes regarding either the nominal anchor or the monetary policy objective set out in the statute, and in the case of central banks that have adopted such changes, there is a preference for the inflation targeting strategy (see Table 1). Thus, the Bank of Japan adopted such an inflation targeting strategy in 2013 as part of a wider strategy to combat deflation (the so-called Abenomics program).

Without changing its dual responsibility for the monetary policy objective, the US Federal Reserve Bank has set a numerical inflation target that, although declared, is not considered an explicit nominal anchor.

Even among the emerging countries, there is a focus on the inflation targeting strategy. Thus, in February 2015, the Reserve Bank of India signed an agreement with the government that formally laid the foundations for an inflation targeting strategy[1], and the central bank of the Russian Federation adopted such a strategy in 2015.

Table 2. Features of monetary policy during post-crisis time

Central Bank from	Nominal Anchor/Strategy	Monetary Policy Objective (according to the Central Bank Statute)
Changes at the nominal anchor level		
Czech Republic (CNB)	inflation, CPI /FIT (since 2008)	Price stability, with secondary objectives
United States (Fed)	implicit/FIT (since 2012)	Price stability and full employment (dual mandate)
Japan (BoJ)	inflation, CPI /IT (since 2013)	Price stability
Russia (CBRF)	inflation, CPI /IT (since 2015)	Currency stability
India (RBI)	inflation, CPI /IT (since 2016)	Price stability
No changes at the nominal anchor level		
Canada (BoC)	inflation, CPI /FIT	Preserving the value of money and price stability
Australia (RBA)	inflation, CPI /IT	Preserving the value of money, full employment and welfare (multiple objectives)

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[1] In June 2016, India formally adopted a flexible inflation targeting strategy, declaring the price stability (based on the CPI inflation target) as the primary objective of the monetary policy.

New Zeeland (RBNZ)	inflation, CPI /FIT	Price stability
Norway (NB)	inflation, CPI /FIT	Price stability
United Kingdom (BoE)	inflation, CPI /IT	Price stability, with secondary objectives
Switzerland (SNB)	implicit, inflation, CPI	Price stability, with secondary objectives
Sweden (SRB)	inflation, CPI /FIT	Price stability
Euro Area (ECB)	implicit/ non-IT	Price stability, with secondary objectives
Denmark (DNB)	exchange rate /ERT	Price stability
Brazil (CBB)	inflation, CPI	Domestic purchasing power
Mexic (BoM)	inflation, CPI	Domestic purchasing power
South Africa (SARB)	inflation, CPI	Currency stability
Turkey (CBRT)	inflation, CPI	Price stability
Poland (NBP)	inflation, CPI	Price stability, with secondary objectives
Romania (NBR)	inflation, CPI	Price stability
Hungary (MNB)	inflation, CPI	Price stability

Sources: Authors' compilation based on up-to-date information from the central banks websites

Notes: CPI=consumer price index; IT=inflation targeting; FIT=forecast inflation targeting; ERT=exchange rate targeting.

In recent years, an increasingly important role has been given to the economic forecasts, and this concern is also found in monetary policy strategies. Generally, inflation targeting central banks have been producing for a long time forecasts of inflation and output gap, but there are not many central banks that have reformulated their monetary policy strategy to capitalize on their own forecasts. They have an inflation-forecast targeting strategy. Unlike the common inflation targeting strategy, the inflation-forecast targeting strategy better describes the behaviour of the central banks that have a dual mandate and with a flexible inflation target, focusing on their own forecasts of inflation and the actions that they propose to follow to bring inflation back to the target in case it deviates. The central banks that adopted the forecasted inflation targeting use forecasting models to explain how they adjust their instruments to meet their inflation-output target. Therefore, the mandate of the central bank, whether explicit or implicit, is shared between these two objectives: although inflation control is the primary objective, another major objective is the output growth stability, especially under the conditions of the minimum interest rate threshold, and significant risks of lowering the long-term inflation expectations. The advantage of such a monetary policy strategy is, among other things, to provide more flexibility in achieving the target, given the wider spectrum regarding the central bank's actions, and this flexibility is all the more important in the context of a limited room for manoeuvre of the monetary policy rate. In the post-crisis period, the Fed has adopted such a strategy

(since 2012), and the Czech National Bank has improved it with the detailed disclosure of its forecasts, including the monetary policy rate (since 2008).

The credibility of the monetary policy decisions is also an important support for predicting inflation targeting as it may be easier to set the market expectations in the direction pursued by the central bank. This feature underpinned the adjustments made by central banks in Canada, the Czech Republic and the US to the instruments used to achieve the inflation target (exchange rate, forward guidance, quantitative easing). In the case of the Bank of Canada, the credibility regarding the inflation-forecast targeting strategy has successfully led to the successful depreciation of the national currency since 2014 to mitigate the impact of falling commodity prices on economic activity. (Clinton et al., 2015) The Czech National Bank pursued the depreciation of the national currency by capping the koruna exchange rate to euro in order to eliminate the risk of deflation, and the Fed, by quantitative easing and forward guidance measures since the adoption of projected inflation targeting, maintained long-term inflation expectations anchored at the 2% target.

One of the key elements of this strategy is the forecasting of an endogenous trajectory of the short-term interest rate and the anticipation of inflationary expectations. Central banks which have such instruments are those of Canada, the Czech Republic, New Zealand and Sweden. This type of strategy has the attributions needed to respond to post-crisis challenges, especially since recent research, such as that made by Gaspar et al. (2016), shows that inflation expectations are better anchored in the medium-term, in countries with an inflation-forecast targeting strategy, providing a stable basis for meeting the monetary policy objective.

Besides the option of the inflation-forecast targeting strategy, which is in fact a reinterpretation of the nominal anchor flexibility and involves the development of the technical forecasting and communication apparatus, there is also the option of integrated inflation targeting framework by including the financial stability policy in the monetary policy strategy. (Criste & Lupu, 2014) This option derives from the need to take into account the objective of financial stability as a result of the link between the dynamics of real interest rates and the global financial cycle, a relationship highlighted by Borio and Zabai (2016) and by Juselius et al. (2016). Starting from the presumption that the financial developments are at the core of the economic fluctuations, whether they lead to a crisis or not, a monetary policy oriented towards financial stability would be the one that permanently takes into account, i.e. throughout the entire financial cycle, this objective. Based on the integrated inflation targeting, a solution proposed by Agénor and Pereira da Silva (2013), and Pereira da Silva (2016), the central bank responsibility is explicitly extended in order to include the objective of financial stability, the interest rate is

set as to directly and clearly respond to an excessive credit growth, and also the macroprudential measures are directed as to meet both, the price stability and the financial stability. However, the problem consists of combining and measuring the three types of policy instruments: the conventional and unconventional measures of monetary policy, and the macroprudential ones, specific to the financial stability policy.

3. Monetary Policy Tools

In order to adjust the monetary policy strategy in the post-crisis period, most changes were made at the level of monetary policy instruments, both in terms of widening the range (diversification by applying non-conventional instruments) and increasing the intensity of their use. The literature analysing the set of instruments used in the post-crisis time is abundant. Some studies focus on the definition and classification of unconventional monetary policy measures (Borio & Disyatat, 2009; Cecioni et al., 2011), other studies either describe the impact of these unconventional measures at the macroeconomic level (Lenza et al, 2010; IMF, 2013), or investigate the challenges emerging from the unconventional measures implementation (Shirai, 2014), and also the limits of their application. (Peersman, 2013) Borio and Zabai (2016) update the information on the application of unconventional monetary policy and consider that these measures should be regarded as exceptional ones, used in special situations, given not only the unclear results of their effectiveness in influencing the financial market variables (bond yields, asset prices, exchange rates), but also the difficulties of assessing their impact on production and inflation, and the uncertainty of their long-term effects considering the central bank's objectives and independence.

The narrowing room for manoeuvre of the policy interest rate, and also the need to support the quantitative and qualitative easing measures applied by central banks of the advanced economies have entailed to a stronger communication between the central bank and the market by the forward guidance policy in order to keep the interest rate expectations at a lower level for a certain period of time. Central banks applying the forward guidance since the early post-crisis stage (Fed, Bank of Sweden) were joined by others: Bank of Japan, Bank of England, European Central Bank and Czech National Bank (see Table 2).

In addition to the traditional ways of communication and the new ones (forward guidance), with a growing frequency, the central banks communicate with the market through price and production forecasts, in order to reduce the uncertainty and any mistakes in predicting and interpreting future policies by the public. As we have already mentioned, some central banks apply an advanced monetary policy strategy by publishing the trajectory of the endogenous interest rate, along with the forecasts of several macroeconomic variables. Thereby, it provides more

information on how the financial assets returns are better aligned with the policy objectives, and also it clarifies the concrete implications of the data dependent policy. According to Alichi et al. (2015), the financial markets have a better adaptation to the post-crisis realities in countries where the central bank communicate the forecasted trajectory of the endogenous interest rate, based on a suitable forecasting model. Such a measure have been recently adopted by the Czech National Bank, namely, in 2008, it begun to publish the forecasted path of the endogenous interest rate, with confidence bands. This is a sophisticated form of the forward guidance policy, in line with the basic principles of the inflation targeting strategy, increasing the monetary policy transparency and providing a more concrete (numerical) version of the expected interest rate path. Such a decision came not only as a result of the post-crisis challenges, such as the achievement of the minimum interest rate threshold (zero lower bound level), but also of the fact that the Czech National Bank is well advanced in terms of macroeconomic forecasts.

Table 2. Central banks using unconventional instruments of monetary policy[*]

Central Banks from	Types of unconventional tools of monetary policy				
	Quantitative easing	Qualitative easing	Exchange rate	Forward guidance	Negative interest rate
United States (Fed)	▨			▨	
Japan (BoJ)		▨		▨	▨
Czech Republic (CNB)			▨	▨	
United Kingdom (BoE)	▨			▨	
Switzerland (SNB)			▨	▨	
Sweden (SRB)	▨			▨	
Euro Area (ECB)	▨			▨	
Denmark (DNB)			▨		

*) *As we've mentioned, the period we refer to is after 2013. Before 2013, several central banks of the emerging economies (especially from Eastern Europe) used the so-called unconventional monetary policy (see Criste, 2015). Also, some central banks of the emerging economies are still using a kind of unconventional monetary instruments (e.g. reserve requirements), but they are different from those considered in this article.*

Limiting the room for the interest rate manoeuvres in a recessionary environment could determine central banks to use the exchange rate as an unconventional monetary policy instrument, given that, when the classic nominal interest rate adjustment mechanism is no longer valid, the real interest rate and the real exchange rate channels could be activated on the expected inflation base. Using the exchange rate as an additional instrument for the monetary policy strategy implies an intense and credible communication of the central bank with the market. Such a measure has been also adopted by the Czech National Bank, since the end of 2013, in order to influence the medium-term expectations, considering the exchange rate

as a shock absorber for the recession. The intensive communication and the higher credibility of the Czech National Bank have been effective (Criste, 2015), because the participants in the financial market understood from the central bank's messages that the monetary policy does not seek to fix the exchange rate, but to stimulate the economic activity, to increase inflation and to reduce the risk of deflation.

An important role for using the exchange rate as an unconventional tool for influencing the market expectations has also the structure of the economy. For an economy with a higher degree of openness, the effects of the exchange rate depreciation on the demand, inflation, and expected inflation are much higher than those registered for a less open economy. The size of the economy is also important; the use of exchange rate instrument does not entail major effects in terms of the beggar-thy-neighbour policy on a smaller economy than on a larger one.

Some central banks (European Central Bank, National Bank of Sweden), concerned about the risks to economic growth and deflation, have adopted the negative interest rate policy, in order to discourage the banks and credit institutions from their proclivity towards holding their excess reserves at the central bank and also to stimulate the lending activity. Other central banks instead have begun to apply negative interest rates to counteract the pressures from both the national currency appreciation and the capital inflow (Denmark National Bank, National Bank of Switzerland). However, it is difficult to assess the effects of negative interest rates, at least because there are several factors which influence the external demand. Negative interest rates may cause national currency depreciations by providing incentives for capital transfers to higher yielding economies, but this tendency could be mitigated by a possible higher inflation or inflation expectations. On the other side, the incentive effect of the negative interest rates on the aggregate demand, and on the asset prices increasing increase in real terms could offset the national currency depreciation.

4. Conclusions

The nominal anchor and monetary policy objectives have not undergone major changes, but it is worth noting that unlike in the early stage of the post-crisis, the criticism of inflation targeting has gradually improved its reputation, not only because those central banks which had such a strategy did not abandon it, but because other central banks have also adopted recently such a strategy (Fed, Bank of Japan, Reserve Bank of India and Bank of Russia).

During post-crisis time, it is noticed an increasing relevance for the inflation-forecast targeting strategy, as it can more easily guide the market expectations in

the direction pursued by the central bank, but it implies a high level of credibility of the central bank's policy.

The adjustment of the monetary policy strategy during post-crisis time mainly meant changes at the level of monetary instruments. As a rule, the central banks, constrained by circumstances, have improved the communication tools and techniques, giving a greater importance to developing and publishing macroeconomic forecasts. In this post-crisis stage, characterized by a higher uncertainty for the future development of the economic activity, we believe that, among the instruments at the central banks' disposal, the communication policy becomes one of the most essential monetary policy tool, especially, because it can contribute to anticipate the public reactions. In addition to the classical communication methods, the forward guidance policy is increasingly important, as well as communicating the forecasts of various macroeconomic variables (inflation, the potential GDP, endogenous interest rate, etc.). For several central banks, the forward guidance policy tends to become a standard and permanent instrument of policy framework, in the post-crisis time, although the transmission mechanism of this decision and its effects are not yet sufficiently studied and known. The persistently low inflation in most economies, below the optimum level (i.e. the target), represents a further challenge for the monetary policy strategy, as this persistence is reflected on the inflationary expectations, which could lead further to a "de-anchoring" of them. Bringing the inflationary expectations to the sustainable path (followed by the central bank) represents a future challenge for monetary policy. It requires, among other things, an improvement in the communication policy, and also in the developing and public dissemination of the forecasts for the macroeconomic and financial variables, in order to achieve a better guiding of the public and to improve the anticipations regarding the economic developments.

Based on the literature proposals concerning the monetary policy strategy, and also on the experience of some central bank which have adapted their monetary policies to the crisis and post-crisis challenges, we believe that, although there is not a valid universal solution, the monetary policy strategies can be adjusted taking into account the features of both the forecast-inflation targeting strategy and the integrated inflation targeting strategy. The latter one implies to explicitly extend the central bank's responsibility by including the financial stability objective into the monetary policy strategy.

As regards the option for an integrated inflation targeting strategy, a further challenge for the monetary policy is to design a rule that takes into account both, the financial developments and the contribution to the mitigation of the financial cycle. Such a rule entails reorienting the monetary policy strategy towards the financial stability objective, but not in a narrow sense, namely adopting a proactive

conduct to counteract the accumulation of the financial imbalances only when they become obvious, but in a broader one, by taking into account the financial developments in a systematic manner, so as not to deviate too long and too far from what it is called "financial balance".

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The Impact of High Performance Work Practices on Project Performance. A Case Study of Construction Companies in South Africa

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Abstract: A vast amount of research advocates that a tight link exits between high performance work practices (HPWPs) and organisational performance. Nonetheless, a detailed study indicating which of these practices offers significant performance in relation to multi-project environments is still lacking. Importantly, project performance is a measure of success in multi-project environments evident in construction firms. The objective of this study is to determine the impact of HPWPs' bundles namely: recruitment and selection (RS), training and development (TD), performance appraisal (PA) and compensation system (CS) on project performance in the construction multi-project companies in Cape Town, South Africa. In this study, perceptual data was obtained using a questionnaire survey of 63 participants working as project team members and administrative staff respectively in select construction companies in Cape Town, South Africa. Stratified and convenience sampling techniques were used to selected the participants. Data were analysed using descriptive and inferential statistics with the help of SPSS, version 24.The statistical results show that out of the four HPWPs, only CS has a significant association with project performance.

Keywords: High performance work practices; Project performance; Construction industry; South Africa; Human resource management

JEL Classification: L740; L840; M120

1. Introduction

Within an organisation, the responsibility for ensuring that employee attitudes, skills, behaviours, knowledge competencies are favourable for effective performance and the achievement of an organisation's strategic objectives and

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competitive advantage lies with the human resource (HR) unit. (Sözbilir, 2016) A growing number of existing literature and studies acknowledge a positive relationship between human resources management (HRM) and organizational performance. (Kouhy, Vedd, Yoshikawa & Innes, 2009) High performance work practices (HPWPs) are crucial to achieving success in organisations. HPWPs" impact on organizational productivity has gained momentum in the fields of HRM and organizational psychology. (Huselid, 1995; Belout & Gauvrea, 2004) Recruitment and selection (RS), training and development (TD), performance appraisals (PA), and compensation system (CS) are four of a host of HPWPs claimed to pose a significant implication on the success of an organisation. (Turner, Huemann & Keegan, 2008; Grobler, Warnich, Carrell, Elbert & Hatfield, 2011) Pirzada, Hayat, IkramAyub and Waheed (2013) are also of the opinion that effective HR practices are supported in any field where HPWPs are well deployed. However, very few studies have attempted to reveal the importance of HPWPs on project performance. (Pinto & Prescott, 1988; Slavianska, 2015)

There were views (such as Belout & Gauvrea, 2004; Belout, 1998) that HRM has no significant impact on project performance. However, recent studies have reported differently. For instance, Harr (2009) suggests that issues such as HRM are some of the problems that confront multi-project environments (MPEs). It is also suggested that companies involved with multi-projects need to focus more on personnel issues because it is the cornerstone of organizational success. (Slavianska, 2015) MPEs are organizations in which all the work is executed as projects and where multiple projects are managed concurrently. (Patanakul & Milosevic, 2008) In this regard, the construction industry has been widely recognized by many researchers as multi-project environments. (Loosemore, Dainty & Lingard, 2003; Meredith & Mantel, 2012) Construction organisations are well known for more use of manpower in business activities as compared to other fields. (Ghatehorde & Chhinzer, 2009) Hence, this study determines the impact of HPWPs namely RS, TD, PA, and CS on project performance in select construction companies in Cape Town, South Africa.

Considering the foregoing, the study poses the following questions: (1) what is the relationship between the four HPWPs and project performance? And (2) what is the role of the four HPWPs" bundles in multi-project environments?

The contention is that the above questions would assist to (1) determine the relationship between the four HPWPs and project performance; and (2) establish the role of the four HPWPs" bundles in multi-project environments.

2. Literature Review

2.1. HRM in the Construction Multi-Project Environment

HRM practices are famous with many researchers citing them as holding affirmative relationship in ensuring organizational success in the past decade and beyond. (Khan & Rasheed, 2015) Khan and Rasheed (2015) also reiterate that a complete structure in an organisation, as far as HRM is concerned constitutes factors such as recruitment and selection; training and development; performance appraisal; and compensation system. These HPWPs have been referred to as the four, core generic functions of HRM designed to impact performance of employees across all organizational levels. (Devanna, Fombrun & Tichy, 1984) The main objective of effectively managing employees is to motivate them so that they can be more productive in their duties.

Loosemore et al. (2003) asserted that "human resources account for the highest costs in most construction projects". Bredin (2006) in a study that looked at aspects that pose challenges in the management of multi-project organizations found that one such important challenge has to do with HRM. Reference is also made to contractual relationships created by subcontractors as having become problematic and because of this Dainty, Grugulis and Langford (2007) as well as Dainty and Loosemore (2012) are of the view that subcontracting in the construction industry needs to be well managed to ensure effective acquisition, organisation and deployment of human resources. Other problematic issues include throw-away personnel policies, reliance on the competence and knowledge of the employees; "high pressured work environment that will leave little space for formal training or staff development, and a lack of incentives for human resource development". (Bredin, 2006)

2.2. Overview of HPWPS

The dynamic and temporary nature of work practices, policies and processes in multi-project organisations pose challenges for both the employee and the organization with regard to how HRM should be practiced. HRM practices, policies and processes have to comply with specific requirements of the multi-project organization. (Keegan, Huemann, & Turner, 2011)

2.2.1. Recruitment and Selection

Recruitment and selection are related processes. Recruitment refers to the process of attracting as many as possible, potential applicants for a vacant position while selection is the process of "choosing from a pool of applicants, the person most suitable for the job". (Grobler et al., 2011)

Huselid (1995) in his review of HRM practices and policies of high performance companies, found that proper application of recruiting and selecting procedures

boost employee productivity, increase organizational performance, and contribute in diminishing turnover. However, poor application of the recruitment and selection practices poses detrimental effects; blocking the company from achieving its objectives thereby dwindling its competitive edge and market share. High training and development costs; high disputes and disciplinary problems; absenteeism; low productivity; and high turnover are common factors that accompany poor application of recruitment and selection practices. (Grobler et al., 2011) Ahmed and Briggs (2012) recommend that construction companies should not rely solely on interviews or reference checks to recruit skilled labour, but in addition apply performance and knowledge tests in order to improve the workforce retention rate. An essential ingredient in recruitment and selection process is transparency especially considering the Labour Relations Act of South Africa. (Nel, Werner, Haasbroek, Poisat, Sono & Schultz, 2008) In short, Coetzee and Schrueder (2010) insist that every organization should establish a systematic recruitment and selection process that should be consistently observed. (Coetzee & Schreuder, 2010)

2.2.2. Training and Development

Training and development are two interrelated, but different concepts as they are applied in the workplace. Training can be defined as the formal and systematic modification of behaviour, attitudes and skills that are critical for successful job performance through learning experiences which can occur through education, instruction, development and planned experience. (Armstrong, 2006; Coetzee, Botha, Truman & Tshilongamulenzhe, 2013) Development is defined as the "process of growing employees and equipping or preparing them for different better or big opportunities other than those required in the current job". (Coetzee et al., 2013) Whilst the main aim of training is focused more on the ability to master and become skilful in the performance of a particular task, the thrust of development is to maintain highly competent staff that are abreast of the competitive global market demands to fulfil future organisational workforce needs. (Snell & Bohlander, 2006; McKenna & Beech, 2014)

Training is one of the most important HRM functions. (Grobler et al., 2011) At the company level, training and development prospects must be reflected in the company's training policy and plan. In a study carried out by Castaneda, Tucker and Haas (2005), lack of training was identified as a contributing factor to the shortage of skilled workforce in the construction sector, and this has exerted a negative impact on project performance. In this regard, Canstaneda et al. (2005) suggest the hiring of better-educated workers, who would receive higher compensation and deliver improved results. Fryer (1990) concur that there is a sudden appreciation of the need to train project team members on skills and

competencies (team work skills) that will enable them to function effectively in team work procedures during the construction project production processes.

2.2.3. Performance Appraisal

HR performance appraisal can be defined "as a process of systematically evaluating performance of the companies" personnel and providing feedback on the measured performance with the aim of making adjustments". (Dransfield, 2000) Sofijanova (2000) defines performance appraisal as the assessment of current or past employee's performance against established standards of performance. This means that if the behaviour of an individual departs significantly from the desired, either positively or negatively, further actions should be taken to improve the actual behaviour. (Minbaeva, 2005) Such actions can entail training or transferring the employee or motivate the employee for better performance. (Noe, Hollenbeck, Gerhart & Wright, 2015) Beardwell and Thompson (2014) point out that effective performance appraisal should contribute remarkably to the success of the organisation by defining the direction for training and development of employees, and feeding the reward system structures.

There is a staggering argument with regard to who has formal responsibility to appraise performance in MPEs. Whilst project managers, because of their day-to-day contact with project workers, are believed to have more influence, line managers have been widely agreed to have the formal responsibility to conduct performance appraisal. (Keegan et al., 2011) In what seemed to buttress the above researchers findings, Roelofs (2012) developed a responsibility distribution based on past literature. The perception was that the role with the highest number of articles supporting it was the role that has a more recognized formal responsibility to regulate HR activity of performance appraisal in MPEs. The results revealed that line managers, followed by project managers are the people with the mandate to conduct performance appraisal.

2.2.4. Compensation Systems

In defining compensation, Grobler et al., (2011) refer to both extrinsic and intrinsic rewards such as salary and benefits, personal goals, autonomy and more challenging job opportunities. A good compensation system should include both intrinsic and extrinsic rewards that are comparable to the market. (Nel et al. 2008) Extrinsic rewards (financial) are divided into monetary rewards (direct payments) and benefits (indirect payments). Monetary benefits can comprise hourly "wage, salary, bonuses, commissions, pay incentives", etc. whilst benefits consist of "insurance, retirement, paid holidays, paid public holidays", etc. Intrinsic rewards (non-financial) cover "recognition, promotion opportunities, working conditions, interesting work, training opportunities", etc. (Grobler et al., 2011) Wages and benefits should be fairly distributed to achieve organizational competitive purposes. (Coetzee & Schrueder, 2010) Perkins and White (2011) coin what is

known as "total reward" proposition that states that compensation should go "beyond those specified in the employment contract to rewarding discretionary effort".

Meanwhile, research has confirmed that "higher pay, greater pay growth" and other rewards are "correlated with higher performance and lower turnover". (Haines, Victory, Jalette & Larose, 2010) Milkovich and Boudreau (1998) revealed a significant influence on firm performance that is exerted by incentive-based compensation. Also, an interesting study by Kazaz and Ulubeyli (2007) in the construction sector in which 82 firms were surveyed, indicated that socio-psychological factors, although gaining momentum, pose less influence on productivity than monetary factors.

2.3. Project Performance

Project performance is the extent at which a project achieves project and business objectives. Various yardsticks have been offered for measuring project performance. It is in fact traditionally agreed that project performance is measured by the potential to meet budgeted time, cost, and quality goals. (Meredith & Mantel, 2012; PMBOK, 2013) However, project performance can also be measured by factors such as "team satisfaction; business success; health and safety; impact on the client; project efficiency; and preparing for the future". (Shenhor, Levy, & Dvir, 1997; Serrador & Turner, 2014) Aaron, Dov, Ofer, Alan and Maltz (2001) outline the following four distinct success measures for project performance "(1) impact on the customer; (2) project efficiency; (3) direct business; and organizational success, and (4) preparing for the future." Meredith and Mantel (2012) argue that the "expectations of the client" is equally an important criterion while Shenhar et al., (2007) are of the opinion that "impact on the team" is a component that can be used to measure project performance. Apart from meeting time, cost and quality goals and the other measures highlighted above, the construction theorists (such as Chan & Tam, 2000) are strongly of the view that health and safety is a significant measure of project performance in the construction industry.

3. Research Methodology

In order to provide answers to the research questions stated above, a self - administered questionnaire was designed, and distributed to select project team members and administrative staff within five construction companies in Cape Town, South Africa.

3.1. Description of Sample

The target population of this study consisted of employees of selected construction companies in Cape Town, South Africa. A sample of 70 employees was drawn from five selected construction companies. Convenience sampling technique was used to select the construction companies. Each company provided between 10 to 15 employees to complete the questionnaires. Stratified sampling technique was employed in the selection of the respondents to complete the questionnaire. The study participants comprised employees who worked as project team members and other line staff such as HR officers, financial managers etc., who were involved or knowledgeable in the running of the projects in the company.

3.2. Description of the Instrument

The study used a structured questionnaire to collect data. In order to compare results with previous studies, a questionnaire was adapted from the highly cited work of Singh (2004) to measure HPWPs.The questionnaire was then adjusted to suit this study based on the existing and reviewed literature. Items to measure project performance were adopted from the five dimensions of project performance proposed by Shenhar and Dvir as cited in Serrador and Turner (2014). Again, this section was adjusted to suit this study based on the existing and reviewed literature, for example, health and safety was added as the sixth dimension.

The structured questionnaire consisted of three sections. Section A captured respondents' information with regard to gender, age, educational qualifications, number of years of service, and job position. Section B consisted of statements that measured project performance. This section consisted of eight items measured on 5-point likert scale, ranging from strongly disagree to strongly agree, with (1) representing strongly disagree and (5) strongly agree. Section C measured the perceptions of participants about the four HPWPs. This section consisted of 20 items measured on 5-point likert scale, ranging from strongly disagree (1) to strongly agree (5).

3.3. Statistical Tests Utilized for Data Analysis

Descriptive statistics was used to find the "frequency of the data; the minimum and maximum range of the data; mean, and standard deviation". (Durrheim, 2002) Inferential statistics were used to find the relationship between variables. This relationship is referred to as "correlation coefficient" which is popularly known as "Pearson product-moment correlation coefficient". (Cronbach, 1970) The utility of SPSS version 24 is acknowledged in these efforts. In this study, the variables comprised the four HPWPs (independent variables) and project performance (dependent variable).

4. Results and Discussion

4.1. Demographic Profile

71.4% of the respondents were males whilst the other 28.6% were females. Of the respondents, 46, 03% had between 5-10 years of work experience in the construction industry, 39, 92% had less than 5 years whilst 19.05% had more than 10 years of work experience. 52.38% of the respondents had a Diploma qualification, 30.16% were in possession of a degree, whilst the other 17.46% were matriculants. 28.57% indicated that they worked as construction/ site managers, 26, 98% confirmed that they were in the category of line admin staff, 15.87% were project managers, whilst 9.52% and 7.94% were engineers and architects respectively. The other 11.11% indicated that they occupied other positions. 53.97% were between the ages of 35 and 55; 39.68% were less than 35 years of age, whilst only 6.35% were above 55 years old. 20.63% of the respondents reported that they had been involved in 20 projects, while 19.05% indicated 10 projects. The others 9.15% reported to have been involved in 15 projects. 19.05% of the respondents were distributed equally to have been involved in 3, 5 or 25 projects, each having a percentage of 6.35% of the respondents. Similarly, respondents who participated in 1, 9, 13, 40 and 45 projects occupied 1.59% of the respondents in each category, whilst 4.76% of the respondents were reported to have been involved each in 8, 30 and 35 projects. Lastly, 3.17% of the respondents reported to have been involved in 6 projects. Overall, 76.2% reported to have been involved in 5 to 45 projects, whilst 23.8% reported to have been involved in less than 5 projects. And only 1.59% of the respondents reported to have been involved in less than 3 projects.

4.2. Coefficient of Determination

In order to obtain coefficient of determination, a multiple regression analysis was applied by considering PP as criterion variable and RS, TD, PA and CS as three predictor variables. The outcome of model summary is depicted in Table 1 below. The coefficient of determination measures the extent to which the independent variable determines the dependent variable. In the current study, as shown below, $R^2 = 0.237$, this means that 23.7% of the variation of PP is directly due to the variation in all of the independent constructs. In simple terms, the variables (RS, TD, PA and CS) are responsible for 23.7% of PP while the remainder (76.3%) is unattributable to any of our variables (i.e. RS, TD, PA and CS). This is an indication that there are other factors, other than RS, TD, PA and CS which significantly influence PP.

Table 1. Regression analysis to obtain a Coefficient of determination

Variables Entered/Removed[a]			
Model	Variables Entered	Variables Removed	Method
1	CS, TD, RS, PA[b]	.	Enter

Model Summary						
					Change Statistics	
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change
1	.487[a]	.237	.185	.35863	.237	4.512

4.3. Research Objectives

4.3.1 The Relationship between the four Hpwps and Project Performance

Correlations are regarded significant if $p \leq 0.01$. Relationships between variables are regarded as weak if r is $\leq \pm0.1$; modest if r is $\leq \pm0.3$; moderate if r is $\leq \pm0.5$; strong if r is $\leq \pm0.8$ and very strong if r is $> \pm0.8$". (Willemse & Nyelisani, 2015)

Therefore, it is important to note that on its own, each of these bundles - RS, TD and PA - has no significant relationship with PP; thus only CS has a significant correlation with PP. In simple terms, this suggests that PP is affected by RS by - 16.8%; TD (-4, 1%); PA (-9, 8%). On the other hand, PP is affected by CS by 29.2%. This indicates that the "relationship which exists between the independent variables" (RS, TD, and PA) and "dependent variable" (PP) is negative. In the same vein when the independent variables (RS, TD and PA) are increased, for example, the dependent variable, PP decreases by the same percentage shown above. However, the negative relationship that exists is not significant. On another note, a positive relationship exists between PP and CS, meaning that when CS is increased for example, PP increases also by 29.2%. This further confirms that when organizations effectively conduct their compensation practices, they are bound to gain 29.2% increase in project performance.

The above findings, particularly the influence of RS, TD and PA on PP are similar to the findings of Pinto and Prescott (1988) which revealed a zero relationship of HR practices in the context of project success. TD's less or no influence on PP "confirms the temporary and unique nature of projects". (PMI, 2008) Projects are time bound and temporary in nature, and as a result, do not run together with activities such as training and development that are long-term. Also, arguments put forward on the need to save costs as a means of "gaining competitive advantage" were less favourable with regard to the effects of TD interventions on project success (Porter, 2008). It is also important to note that TD consumes money.

Hence, since multi-project organisations are constrained by costs, time and quality, they consider not engaging in TD as a prudent strategy of managing project cost. (PMI, 2008) However, the weak influences of RS and PA on PP in the current study are antagonistic to the findings of Sarwar, Aftab, Sarwar and Shahid (2016) who found that out of three HRM practices, RS and PA have significant influence on project success. With regard to the influence of CS on PP, the findings of this study echo the findings of Khan and Rasheed (2015) and, Belout and Gauvreau (2004). Khan and Rasheed (2015) as well as Belout and Gauvreau's (2004) findings advocate the significant role of HRM on project performance as opposed to the study of Pinto and Prescott (1988). CS has a "positive and significant relationship with project success in Pakistani project-based organizations". (Khan & Rasheed, 2015) Overall, the weak, positive and negative relationship of the four HPWPs with project performance as perceived by the respondents was compatible with the findings of Loosemore et al. (2003) who reveal that most of the construction industry's employment practices are informal. It is also argued that "project teams need little attention, and project managers pay little attention to human resources", with more "focus on structuring and planning operations". (Belout, 1998) In addition, Dainty, Grugulis and Langford (2007) review of the current context of construction employment, reflected skills shortages and informal employment practices as impediment to productivity in the construction industry.

Table 2. Correlation analysis of the variables

Correlations		PP	RS	TD	PA	CS
PP	Pearson Correlation	1	-.168	-.041	-.098	.292[*]
	p-value (2-tailed)		.188	.752	.443	.020
	N	63	63	63	63	63
RS	Pearson Correlation	-.168	1	.367[**]	.666[**]	.522[**]
	p-value (2-tailed)	.188		.003	.000	.000
	N	63	63	63	63	63
TD	Pearson Correlation	-.041	.367[**]	1	.618[**]	.225
	p-value (2-tailed)	.752	.003		.000	.076
	N	63	63	63	63	63
PA	Pearson Correlation	-.098	.666[**]	.618[**]	1	.492[**]
	p-value (2-tailed)	.443	.000	.000		.000
	N	63	63	63	63	63
CS	Pearson Correlation	.292[*]	.522[**]	.225	.492[**]	1
	p-value (2-tailed)	.020	.000	.076	.000	
	N	63	63	63	63	63
*Correlation is significant at the 0.05 level (2-tailed).						
**Correlation is significant at the 0.01 level (2-tailed).						

4.3.2. The Role of the four Hpwps' Bundles in Multi-Project Environments

With regard to this research objective, the four HPWPs referred to are RS, TD, PA and CS. All these variables were measured as independent variables to PP. As shown below (Table 3), amongst the independent variables, RS and CS had the highest means of 3.9246 and 3.9087 respectively. This means that on average, the respondents perceive a positive and relatively good application of RS and CS in their organisations. PA recorded the smallest mean of 3.4921 whilst TD scored a mean of 3.7857. This means that, on average, the two variables although their means are above half, were considered by the respondents to be relatively medium and below the desired standard. Similarly, RS and CS scored smallest standard deviations and range values. With regard to the standard deviation, RS recorded 0.59167 whereas CS scored the smallest 0.49656. In terms of the range value, RS indicated 2.75 whereas CS recorded 2.25. On the other hand, TD and PA had standard deviations of 0.68877 and 0.60199. The range values for TD and PA were 3.00 and 2.50 respectively. The smallest standard deviation and range values scored for RS and CS as compared to their counterparts: TD and PA, indicate that the respondents had relatively similar perceptions with regard to the applications of RS and CS in their organisations as compared to TD and PA, which revealed that respondents had relatively divergent perceptions with regard to their applications in the organisations.

Table 3. Means, Standard deviations and Ranges for PP, RS, TD, PA and CS

Statistics		PP	RS	TD	PA	CS
N	Valid	63	63	63	63	63
	Missing	0	0	0	0	0
Mean		4.2083	3.9246	3.7857	3.4921	3.9087
Std. Deviation		.39719	.59167	.68877	.60199	.49656
Range		1.75	2.75	3.00	2.50	2.25

These results are contrary to the findings of Marwat, Qureshi and Ramay (2007), which realised high means in TD and PA as compared to CS. Similarly, small values for standard deviations and range were recorded in TD and PA. For standard deviation, both TD and PA are 0.81 whilst CS and RS record 1.18 and 0.85 respectively. (Marwat, et al., 2007) With regard to the range, TD and PA score 3.67 and 3.57 respectively whilst RS and CS both score 4.0. Our results are somewhat similar to that of Khan and Rasheed (2015) on only the standard deviation of CS and mean of RS. Their findings had the highest mean recorded for RS whilst the lowest standard deviation was recorded for CS. (Khan & Rasheed, 2015)

4. Conclusion

In a nutshell, this study contributes to the body of knowledge on theories and their applications regarding HPWPs and project performance in multi-project environments. Essentially, this study confirms the commonly held notion that organisational productivity is also dependent upon HPWPs. The main objective of this study was to, based on the participants' knowledge and experience of working with projects, determine the perceptions of project team members (project managers, engineers, architects, contractors, site managers and quantity surveyors) and some line managers (financial managers, HR managers, etc. and administrative staff) on the effects of HPWPs on project performance in their construction organizations, and the role the four HPWPs have on multi-project construction organisation. The study was motivated by the fact that detailed study of HRM in the project management field was still incomplete to offer any meaningful conclusions regarding its significance in the management of projects, particularly as to which practices pose significant impact on project performance. Also, where studies concentrated on HRM in the project management field, most of it investigated the management of single projects instead of multi-project environments, and few focused on individual HPWPs on project performance. Moreover, Dainty and Loosemore (2012) state that "despite its size and socio-economic significance, the construction sector remains a poorly understood industry, particularly in relation to its people management practices."

Pertaining to the relationship between RS, TD, PA and CS and project performance, and the extent and direction of relationship, this study concludes that TD, RS and PA have a negative relationship with project performance while CS has a positive but weak relationship. Also, only CS and RS policies and practices have proven to be moderately applied in accordance with the minimum HR and labour legislations expected standards. However, although TD and PA policies and practices are being aligned with some HR and labour legislations, the alignment is somehow arbitrary and not up to expected standard. This means that construction organisations need to invest their stake more in the four HPWPs if they are to realise the benefits derivable from effective deployment of HPWPs.

5. Research Limitations and Future Plan

This study focused on selected construction organizations in Cape Town, South Africa. Owing to the fact that multi-project organizations are not limited to the construction industry only, but can exist in other industries, namely manufacturing industries, this study cannot be generalized to other organisations in South Africa and other developing nations. This means that future research can be extended to other industries and developing countries where multi-projects are executed.

Methodologically, this study utilised a limited sample coupled with a self-administered structured questionnaire. Future research can study the same population, involving a larger sample with the questionnaire containing both closed and open-ended questions in order to obtain more in depth insights into the subject matter.

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Food Security Situation among South African Urban Agricultural Households: Evidence from Limpopo Province

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Abstract: The challenges posed by risk factors in the urban agricultural sector have been an issue of general concern among various stakeholders and the international communities. This concern is attributable to the negative impacts of food insecurity risk on urban agriculture and socio-economic development of South Africa. This study analyzed the food security situation among urban agricultural households of Limpopo Province using a well-structured questionnaire for data collection. Data were analyzed using descriptive and inferential statistics. The study revealed that male respondents were more in the study area with an average age of 46 years. Public tap water was the most used source in the study area with an average monthly income of R2668.75 recorded. In addition, an average of R1284.75 is expended on food on monthly basis by the agricultural households. Finally, some implications for national food security were drawn from the overall result of the study. It was suggested among other things that interest-free credit should be made available to small-scale farmers to enable them to access improved risk (such as health, drought etc.) management technologies. This will help them to contribute more meaningfully to national food security through enhanced productivity.

Keywords: Food security; Households' water source; Limpopo province; Probit regression; Tobit regression.

JEL Classification: Q18; R51

1. Introduction

Globally, food insecurity continues to be a pressing concern to policymakers with its highest prevalence in Africa. (Pérez-Escamilla et al., 2017) Chronic poverty

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persists in Africa and recent estimates have shown that more than one-quarter of the population is suffering from hunger. (FAO, 2016) The eradication of poverty which is a causal variable for food insecurity remains a crucial issue for many developing nations in Africa. (Mabuza et al., 2015; Regmi & Paudel, 2016) In a continent rapidly undergoing urbanization with a projected estimate of above 50 percent of the population living in urban areas by 2030 (Crush & Frayne, 2011), achieving urban food security is, therefore, a key developmental challenge to focus upon. At the moment, South Africa is one of the upper-middle-income countries in the continent with a stable and robust economy. (World Bank, 2011) Although, South Africa is said to be food secure at the national level, however, available statistics suggest that a large number of households within the country are still food insecure. (D'Haese et al., 2011; Hart, 2009)

As stated by the United Nations Human Settlements Programme (UN-HABITAT), about two-thirds of the population of South Africa currently resides in urban areas. (Van der Merwe, 2011) Thus, the urban food insecurity in South Africa can no longer be overlooked as the urban areas of South Africa are now faced with tackling the challenges of ensuring physical and economic access to sufficient food supply and clean water for this large-scale population influx. The Food and Agriculture Organization of the United Nations (FAO, 2009) states that food security exists when people at all times have access to sufficient, safe and nutritious food and water to meet their dietary needs to attain an active and healthy life. This definition of food security is founded on the three dimensions of food availability, accessibility, and utilization.

Firstly, the availability of food specifically ensures that there are sufficient qualities of food on a consistent basis. Secondly, accessibility to food tackles having enough resources to obtain food for a nourishing diet. Lastly, food utilization or security requires knowledge of nutrition and healt. (WHO, 2016; Van Vuuren, 2016) Urban food security can, therefore, said to be achieved in a household when there is guaranteed access to food, clean water, and a healthy environment for all members. Urban Agriculture is one of the main strategies and viable tools that can be used to increase urban food security (Van Vuuren, 2016), as the Food and Agricultural Organization has established a connection between Urban Agriculture and Urban Food Security. (FAO, 2009)

Urban Agriculture was defined by Van Veerhuizen (2006), as "the growing of plants and the raising of animals for food and other use within and around cities or towns, and related activity such as the production and delivery of inputs, and the processing and marketing of products." He further stated that Urban Agriculture is associated with characteristics such as competition for land and limited urban space, the reuse of urban resources, the distance to the market, the location of

Urban Agriculture, the degree of a farmer's organization, and lastly, aspects of socialization among farmers. (Van Vuuren, 2016)

There are currently high levels of food insecurity in South African cities and the continual increase in food prices and other price shocks suggest that levels of urban food insecurity are unlikely to improve. According to D'Haese et al., (2011), 52 percent of households in Limpopo province are severely food insecure while about one-third are living on less than one dollar a day. The Urban dimensions of food insecurity are characterized by low dietary diversity, high malnutrition and obesity, and distinct hunger seasons. (South African Cities Network (SACN), 2015)

Embarking on Urban agriculture is one of the strategies utilized by urban households in South Africa to mitigate food insecurity. (SACN, 2015) However, there are a lot of risk factors militating against urban agriculture and consequently food security. With this in view, it is important to address the capacity and production needs of urban farmers by paying particular attention to those obstacles impeding their abilities to maximize their capacities in food production.

Therefore there is the need to determine the food security situation among urban farmers in Limpopo province, a major agricultural hub in South Africa, so as to shed light on the right strategies to embark upon in achieving two of the cardinal sustainable development goals of "no poverty" and "zero hunger" for all in the urban areas of South Africa. Specifically, the study is focused on describing the socio-economic characteristics of the urban farmers in Limpopo province, examining the determinants of the urban household income and determining the factors influencing the urban farming household"s food security in the study area.

2. Research Methodology

2.1. Description of the Data source and Study Area

The study was carried out in Sekhukhune district of Limpopo province. The district is situated in the south-eastern part of Limpopo province. It is one of the five districts of Limpopo province of South Africa. The seat of Sekhukhune is Groblersdal. It has a total land area of 13,528 km^2 (5,223 sq mi) square kilometers. The 2011 population census estimated the population of the district at 1, 076, 840 people (Statistics South Africa, 2011). The major economic activities of the inhabitants of this district are agriculture, mining, construction, trade, transport, and finance.

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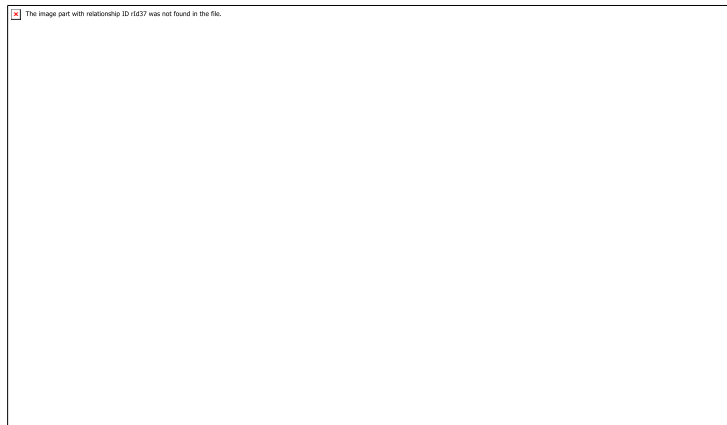
2.2. Sample Design and Data collection

Primary data were used in this study. Structured questionnaires were used in the collection of primary data with the household being the unit of analysis. Questionnaires were administered according to the various locations in the local municipalities. In this study, two local municipalities were purposively selected out of five municipalities in the district. This is because the two municipalities were the most populated local municipalities in the district and also known for agricultural activities. Within each municipality, 40 small-scale urban farmers were selected through the use of stratified random sampling technique making a sum of 80 respondent used in this study. This was done proportionately with respect to the number of households in each location. Furthermore, information was collected on age, occupation, household size, and gender of the household head as well as other households' socioeconomic characteristics such as monthly income and dependency ratio. Data were also collected on monthly household expenditure on food and non-food items.

2.3. Analytical Techniques

2.3.1. Modeling the Determinants of Agricultural Households' Income in the Limpopo Province of South Africa

This study used the Tobit regression to achieve this objective (determinants of the agricultural households' income in the province) since the dependent variable was income received from various on and off-farm activities which involved a number of zero values and thus Tobit model was used to avoid bias as shown in the table (1). Tobit regression model was initially developed by the Nobel laureate economist, James Tobin in 1958. A sample from which the information about the dependent variable is available only for a number of observations is called the censored sample. Thus, the Tobit model used in this study is also commonly known as the censored regression model. Other authors describe such models as

the limited dependent variable regression models due to the restriction imposed on the values that are taken by the dependent variable. The model is specified thus,

$$Yi* = Xi\beta + \mu i .... (1.0)$$

$_i$ = 1, 2…n Variables (Table 1) included in the model.

Y = households income

Table 1. Independent variable and the description of the Tobit regression model of the determinants of agricultural households' income in Limpopo Province of South Africa

Independent Variable	Description
Households Size	Number of members of the household (Continuous)
Gender of the House head	Dummy; 1 if head is male 0 if female
Employment Status	Dummy; 1 if yes, 0 if otherwise
Households Sickness Record	Dummy; 1 if yes, 0 if otherwise
Farm Accessibility	Dummy; 1 if yes, 0 if otherwise
Animal possession	Dummy; 1 if yes, 0 if otherwise
Food expenditure	Total value in Rand (Continuous)
No food incidence	Dummy; 1 if yes, 0 if otherwise
High food price	Dummy; 1 if yes, 0 if otherwise
Presence of Shock	Dummy; 1 if yes, 0 if otherwise
Shock impact	Dummy; 1 if strongly agree, 0 if otherwise
Shock compensations	Dummy; 1 if yes, 0 if otherwise
Water source	0 = well, 1 = borehole, 2 = river, 3 = tap, 4= rain 5= others(Categorical)

2.3.2. Estimation of Probit Regression model

Probit regression model was fitted to identify factors that influence farming households' nutrition. This model was used because it is the standard method for estimating binary-category dependent variable and also due to the dichotomous nature of the dependent variable which was the re-categorized dummy form of the actual dietary diversity score as shown in the regression form (where food security level was with value 1 if rrespondent' are food secured and 0 otherwise). This is shown in the table (2). The model can then be specified as:

$$Yj = \alpha \beta j \sum_{i=1}^{n} Ij + uj .... \qquad (2.0)$$

$$Pi = \alpha o + \alpha 1X1 + \alpha 2X2 + \alpha 3X3 + \alpha 4X4 + \alpha 5X5 + \alpha 6X6 + \alpha nXn + ..+ei \quad (3.0)$$

Where Y_j is the binary dependent variable indicating households' food security status; 1 if the household is food secured and 0 otherwise.

α and β$_j$ are the parameters of the estimates

n = number variables,

μ$_j$= Error term

I_j = The independent variables specified in Table 2.

Table 2. Independent variable and their description (Probit Regression Model) of the assessment of the farming household's food security in the study

Independent Variable	Description
Households Size	Number of members of the household
Educational Status of the Head	Number of educational years (Continuous)
Presence of Shock	Dummy; 1 if Yes, 0 if otherwise
Drought shock	Dummy; 1 if Yes, 0 if otherwise
Gender	Dummy; 1 if head is male 0 if female
Household Heads' Age	Number of years (Continuous)
Employment Status	Dummy; 1 if yes, 0 if otherwise
Households Sickness Record	Dummy; 1 if yes, 0 if otherwise
Source of power	Dummy; 1 if yes, 0 if otherwise
Cooking fuel	Dummy; 1 if yes, 0 if otherwise
Water source	0 = well, 1 = borehole, 2 = river, 3 = tap, 4= rain 5= others (Categorical)
Asset ownership	Dummy; 1 if yes, 0 if otherwise
Household livelihood	1 if good and 0, otherwise
Household income	Total value in Rand (Continuous)
Food expenditure	Total value in Rand (Continuous)
Crop grown	1 if Arable crops, 0 otherwise
Adult eating pattern	1 if Regular and 0, otherwise
Child eating pattern	1 if Regular and 0, otherwise
Theft shock	Dummy; 1 if yes, 0 if otherwise
Death of family	Dummy; 1 if yes, 0 if otherwise

3. Results and Discussion

3.1. Socio-economic characteristics of the Urban Farmers in Limpopo Province

The findings from the table (3) show that majority of the urban farmers fall within the age interval of 21-60 years and their mean age was 46 years. This implies that the urban farmers in the province are generally in their economically active years and should be innovative, energetic and enterprising. This is in consonance with Baiyegunhi et al., (2016) who stated that majority of farmers in Limpopo province are in their active and productive age. This attribute is supposed to give them the leverage to participate more in urban agriculture. The results obtained further indicated that both male farmers (56.3%) and their female (43.7%) counterparts

participated well in Urban Agriculture in the study area. This agrees with Ganiyu and Omotayo (2016); Oni et al., (2010) who reported a similar trend in Vhembe district of Limpopo province.

More so, the majority (80.1%) of the respondents had a household size of one to six persons and a mean household size of five persons was recorded for the study area. This is in consonance with Adeniyi et al (2016); Baloyi (2011), who stated that the average household size in Ga-Mothiba district of Limpopo province is 5.6 persons. The implication of this is that the urban farmers in the study area can moderately have access to labour from their household members which provide an easy avenue for them to reduce their labour cost.

Also, three-quarter (75.0%) of the urban farmers had at least six years of formal education. This finding is corroborated by Oni *et al.*, (2011) who stated that most of the farmers in Limpopo province have one form of formal education or the other. This attribute is expected to enhance the information seeking behavior of the farmers and their use of innovative production practices.

The findings from the table (3) further showed that majority (78.8%) of the urban farming households in the area made use of public tap/piped water as their major source of water. This agrees with D'Haese *et al.*, (2011) who also reported a similar trend in their study. This implies that farmers in the area have access to a good source of water and this is expected to contribute positively to the food and nutrition security status of the urban farming household in the area.

The average monthly income per household recorded among the urban farmers in the area was R 2,668.75. This implies that majority of the respondents in the area were living on less than 1.5 USD a day using the concept of average daily household income per capita. Further results from the table (3) show that about 50 percent of the monthly income of the urban farmers is spent on food. According to Engel's law, this makes the urban farming household less well-off in terms of livelihood because the share of their total expenditure that goes to food is high. (Aliber, 2009)

Table 3. Socio-economic characteristics of respondents

Variables	Frequency	Percentage	Mean
Age			
21-40	29	36.25	46 years
41-60	34	42.50	
61-80	17	21.25	
Gender			
Male	45	56.2	
Female	35	43.8	
Household Size			
1-3	37	46.2	5 persons

4-6	27	33.8	
7-9	16	20.0	
Years of Education			
1-3	29	36.2	
4-6	31	38.8	
7-9	20	25.0	
Water Source			
Public/Piped Water	63	78.8	
Borehole Water	15	18.8	
Pond, Lake & River Water	2	2.5	
Income (rand)			
1-1000	23	28.8	2668.75
1001-2000	8	10.0	
2001-3000	18	22.5	
3001-4000	17	21.3	
4001-5000	10	12.5	
5001-6000	4	5.0	
Food Expenses (rand)			
1-1000	32	40.0	1284.75/month
1001-2000	44	55.0	
2001-3000	4	5.0	
Other Expenses (rand)			
1-1000	71	88.8	
1001-2000	0	0	
2001-3000	0	0	
3001-4000	5	6.3	
4001-5000	4	5.0	

3.2. Estimates of Tobit Regression of Factors influencing Agricultural Households' Income in Limpopo Province

Table (4) shows the results of the Tobit regression which determined the factors influencing the agricultural households' income in the study area. However, F-test shows that the estimates of the equation of the model were jointly significant at ($p<0.01$) level of significance. The pseudo-R-square is 0.0236. From the thirteen included variables only eight were statistically significant at different levels (Households size ($p<0.01$), employment status ($p<0.01$), accessibility to farm ($p<0.05$), animal possession ($p<0.10$), high food possession ($p<0.10$), shocks ($p<0.05$), shock impact ($p<0.01$) and respondents water source ($p<0.10$). Furthermore, results of the Tobit model presented the marginal effects of each variable. Test for multicollinearity among the variables was carried out with variance inflation factor (VIF) and the mean VIF was 1.92 (see Table 5). Also, high level of tolerance computed for the variables indicates that there was the absence of serious multicollinearity among the variables.

In the study, the parameter of households' size has a negative (-370.1264) effect on their income (p<0.01), meaning that increase in respondents household size leads to a reduction in households' income. In addition, larger household's size will lead to a lesser income of the agricultural households. This is not in line with the *a priori* expectation as the heads are supposed to have better income. However, this could be due to the economic situation of the nation which is generally characterized by the low income of households in the nation. Also, the coefficient of respondent's employment status was negative (-318.2081) and significant at (p<0.01) level of significance. This indicates that employment status of respondents is negatively related to the households' income in the study area. By implication, this implies that the farming households' employment status is negative and significant to their income. This is to say that as the households get more employment, their income reduces. This is not in line with the *a priori* expectation of the study.

Furthermore, the parameter of respondents possession of animal is negative (-673.0762) and significant at (p<0.10) level of significance. This means that respondents with farm animals have a lower tendency of having a good income. This is not in line with the *a priori* knowledge of this study. More so, the coefficient of respondents food price was negative (-1038.644) and significant at (p<0.10) level of significance. This indicates that respondent's food price have a lesser likelihood of influencing their income status. In addition, shock and shock impact were found significant at (p<0.05) and (p<0.10) level of significance to their income level, this is in line with the *a priori* expectation as a type of shock and its impact is expected to affect the urban agricultural households in the study area. Expectedly, the farming households' parameter of water source was negative (-453.242) and significant (p<0.10). This indicates that the source of water consumed by the agricultural households has a lesser likelihood of influencing their income status in the study area.

Table 4. Tobit regression results of the factors influencing agricultural households'
income in Limpopo Province

Household income	Coefficient	Std. Error	t	P>|t|	Tolerance
Household Size	-370.1264	74.69197	-4.96	0.000	0.5328
Gender of the House head	521.319	365.5402	1.43	0.158	0.6673
Employment Status	-318.2081	110.6235	-2.88	0.005	0.5050
Household Sickness Record	-225.131	417.9472	-0.54	0.592	0.5784
Farm Accessibility	913.2278	404.7518	2.26	0.027	0.5299
Animal possession	-673.0762	355.1493	-1.90	0.062	0.7798
Food expenditure	-245.215	152.0958	-0.98	0.329	0.5698
No food	-206.0404	209.7586	-0.98	0.329	0.7451
High food price	-1038.644	527.1203	-1.97	0.053	0.3891
Shock	86.24057	43.03042	2.00	0.049	0.5687

Shock impact	-537.1986	187.2236	-2.87	0.005	0.3091
Shock compensations	21.24364	30.15156	0.70	0.484	0.3658
Water source	-453.242	268.8034	-1.69	0.096	0.5933
Constant	6375.871	1577.098	4.04	0.000	
Observation Number	80				
LR chi^2 (13)	32.61				
Prob> chi^2	0.0019				
Pseudo R^2	0.0236				
Log likelihood	-674.52895				

Table 5. Multi-collinearity test of variables

Variables	VIF	SQRT VIF	Tolerance	Eigenvalue
Household income	1.51	1.23	0.6638	11.5148
Household size	1.88	1.37	0.5328	1.0815
Gender	1.50	1.22	0.6673	4.6309
Employment	1.98	1.41	0.5050	0.4429
Household sickness	1.73	1.31	0.5784	0.3164
Farm access	1.89	1.37	0.5299	0.2971
Animal possession	1.28	1.13	0.7798	0.1979
Food expenditure	1.75	1.32	0.5698	0.1832
No food	1.34	1.16	0.7451	0.1230
High food price	2.57	1.60	0.3891	0.0930
Shock	1.76	1.33	0.5687	0.0792
Shock impact	3.24	1.80	0.3091	0.0536
Shock compensation	2.73	1.65	0.3658	0.0477
Water source	1.69	1.30	0.5933	0.0262
Mean VIF	1.92			

3.3. Estimates of Probit Regression of the Assessment of the Farming Household's Food Security in the Study Area

Table (6) shows the results of the Probit regression which assessed the factors influencing farming households food security. The result shows that the model produced good fits for the data as revealed by statistical significance of the Likelihood Ratio Chi-Square ($p<0.01$). The marginal parameters were also used for interpretation of the results. In order to avoid inconsistency and biases from the estimated parameters, the study subjected the variables to multicollinearity test using Collin command in STATA. Test for multicollinearity among the variables was carried out with Variance Inflation Factor (VIF) and the mean VIF of the variables was 2.86 (See Table 7).

Also, high level of tolerance computed for the variables indicates that there was the absence of serious multicollinearity in the analysis. In the study, ten out of the twenty variables analyzed were found to have significantly influenced farming households' food security in the study area. These variables included households"

size, shock and drought shock, the age of household head, employment status of the head, asset ownership of the head, household income, a crop was grown, theft and death record in the family. The parameter of household size was statistically significant (p<0.10) with a positive coefficient (0.2378) to respondents' food security status in this model. This indicates that households size influenced the probability of households' being food secure in the study area. This further implies that household's size had a significantly higher probability of influencing their food security status in the study area. This is in line with the finding of Babatunde *et al*., (2007) who reported that as the household size increases, the probability of food security decreases.

In addition, the coefficient of households shock and drought shock experience was also found to be positive (0.5737) and significant (p<0.05). This indicates that as the agricultural household's experience of drought and other forms of shocks increases, the food insecurity condition of such households' increases. The positive and significant effect of the household shocks increases the probability of households being food insecure. This is in line with the *a priori* expectation of this study, as more shock experienced by the agricultural households could directly influence family members' food insecurity status.

In the same vein, the parameter of household's age was positive (0.9472) and significant (p<0.05). This indicates that age of the farming households' increases the probability of increasing their food security status. Also, employment status, asset ownership and income of the respondents have a critical contribution to their food security status in the study area. Furthermore, the parameter of respondents' crop grown, theft incidence and death record in the family were found positively significant in the study at (p<0.05), (p<0.05) and (p<0.10) which indicates that as the agricultural households crop that was cultivated, theft incidence and death record increases the probability of increase in their food security status.

Table 6. Probit regression results of the assessment of the farming household's food security in the study area

	Coefficient	Std. Error	Z	P>|z	Marginal effects	Tolerance
Household size	.2378807	.1400632	1.70	0.089	.0424329	0.4694
Education	-.37175	.246638	-0.15	0.880	-.0066312	0.4140
Shock	-.573759	.2589819	-2.22	0.027	-.1023466	0.2973
Drought shock	-8.597943	3.535554	-2.43	0.015	-.2663342	0.2399
Gender	1.683225	1.121214	1.50	0.1333	.3002521	0.4121
Household head age	.9472738	.378212	2.50	0.012	.1689738	0.4359
Employment	-.5091104	.2580137	-1.97	0.048	-.0908146	0.3666
Household sickness	-.1836794	.716439	-0.26	0.798	-0.327646	0.4156

Source of power	.9459561	.72200244	1.31	0.190	.1687387	0.3905
Cooking fuel	.5316287	1.161315	0.46	0.647	.0948314	0.4067
Water source	-.4565023	1.132291	-0.40	0.687	-.0814304	0.3493
Asset ownership	-.4216384	.2548724	-1.65	0.098	-.0752115	0.4132
Household livelihood	-.0583322	.0704307	-0.83	0.408	-.0104052	0.3524
Household income	-1.029442	.5398118	-1.91	0.057	-.1836309	0.1726
Food expenditure	.1386634	.3720467	0.37	0.709	.0247346	0.2057
Crop grown	.6738691	.2682137	2.51	0.012	.1202041	0.3257
Adult eating pattern	-1.516066	.9964504	-1.52	0.128	-.2704344	0.3590
Child eating pattern	-.2921364	.6379064	-0.46	0.647	-.052111	0.5215
Theft	5.388979	2.690162	2.00	0.045	.9457412	0.5015
Death of family	3.239575	1.883803	1.72	0.085	.8942156	0.4248
Constant	4.284745	4.177338	1.03	0.305		
Observation Number LR chi^2 (20) Prob> chi^2 Pseudo R^2 Log likelihood	80 67.61 0.0000 0.6278 -20.036929					

Table 7. Multi-collinearity test of variables

Variables	VIF	VIF	Tolerance	Eigenvalue
No food	2.29	1.51	0.4360	15.9952
Household size	2.13	1.46	0.4694	1.4031
Education	2.42	1.55	0.4140	1.0711
Shock	3.36	1.83	0.2973	0.9927
Drought shock	4.17	2.04	0.2399	0.6624
Gender	2.43	1.56	0.4121	0.3642
Household head age	2.29	1.51	0.4359	0.3446
Employment	2.73	1.65	0.3666	0.2310
Household sickness	2.41	1.55	0.4156	0.1935
Source of power	2.56	1.60	0.3905	0.1417
Cooking fuel	2.46	1.57	0.4067	0.1379
Water source	2.86	1.69	0.3493	0.0924
Asset ownership	2.42	1.56	0.4132	0.0853
Household livelihood	2.84	1.68	0.3524	0.0696
Household income	5.79	2.41	0.1726	0.0578
Food expenditure	4.86	2.20	0.2057	0.0483
Crop grown	3.07	1.75	0.3257	0.0384

Adult eating pattern	2.79	1.67	0.3590	0.0256
Child eating pattern	1.92	1.38	0.5215	0.0193
Theft	1.99	1.41	0.4985	0.0132
Death of family	2.35	1.53	0.4248	0.0072
Mean VIF	2.86			

4. Conclusion

This paper explained the food security situation among South African Urban Agricultural households in Limpopo Province of South Africa. This study brought to the limelight some salient policy issues that should be urgently addressed in order to mitigate the food insecurity issues among the urban households in Limpopo Province of South Africa. In conclusion, the rural farming households in the Province of South Africa are witnessing different dimensions of food (in)security which is obviously affecting different aspects of their social and economic activities even on daily basis.

5. Recommendations

It is recommended that South African government should ensure that the teaming unemployed youths are encouraged to practice agriculture so as to replace the aging farmers in the rural parts of the country. Also, drought shock, theft and other forms of negative occurrence should be critically appraised by the government of the day. Finally, financial support should be rendered to the poor Urban Agricultural households in order to invest in the agricultural enterprise for better food security. The onus, therefore, rests on the government to provide a holistic approach to the grass root food security state of South Africa so as to effect a timely intervention in order to rescue the Urban Agricultural households in the study area.

6. Disclosure Statement

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Analysis of the Relationship between Bond Value and Share Value in the Security Market

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Abstract: This paper evaluates the bond and share value relationship to provide additional information for investors' decisions regarding investments in bonds and shares. It used bond and share values from one large advanced economy stock market (Japan) and from one developing economy stock market (Kenya). The paper is pertinent, as little prior research has combined advanced and developing economy stock market in such analysis. Applying a panel data with the OLS regression, it found that in both the advanced and developing economy stock markets, a significant but negative relationship exists between the share values and bond values. This thus provides a practical information for bond and share investors to know when to dive into a particular investment and to the academia for research and academic inquisition. The paper provides an agenda for further research to expand this analysis by pooling together a number of large advanced economy stock markets and a number of developing economy stock markets. Such future research would determine the degree with which one of the variables (bond value or share value), affect each other in advanced and developing economies – to provide more information to international stock speculators.

Keywords: Financial markets; bond investment; stock investment; advanced market; developing market

JEL Classification: G; G1; G11; G12; G13

1. Introduction

Bond and shares are amongst the most important traded financial instruments, which offer valuable economic function of transferring resources from the wealthy to the needy and providing information about price of capital for strategic economic planning decisions for governments and businesses. (The Economist, 2017) Prior research has bestowed the veracity, that not only does the invisible hand instil uncertainties and implicit risk of price or value oscillation in bonds and shares, but also that both time and an amalgam of systemic and un-systemic vagaries from business conditions (Fama & French 1989) constitute mixed factors that make bond and share values prediction somewhat tenuous. However, studies

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over the years seem to support a trend, for example, Bao and Hou (2014) opine that time factor might be a precursor that stimulates a correlated movement between equities and bonds. Of vital importance is that the understanding of their movement assists investors to hedge related risks. (Bao & Hou, 2014) This interrelatedness between stocks and bonds has motivated recent research for link between stock and bond returns. (Koijen, Lustig & Van Nieuwerburgh, 2017) Various diverse studies have thus emerged with different perspectives on bond and share value relationship. Bao and Hou (2014) analysed the heterogeneity in the related movement of corporate stocks and bonds. Adrian, Crump and Vogt (2015) investigated the non-linearity between shares and bonds. The prediction of bond risk premium using out of sample data has also received research attention. (Zhu, 2015)

Contemporary investors are diversifying investments to international stock markets outside of developed nations to take advantage of potential investment opportunities and values in developing markets. (Ghysels, Plazzi & Valkanov, 2016) Such investors would continuously need information that presents a comparable view of bond and share performance in both developed and developing markets. This research presents this view by using data from an advanced market (Japan) and from a developing market (Kenya) to demonstrate the relatedness between bond and share values. This paper is therefore important for investors as it provides germane information that supports their quest for diversification to developing markets. This is particularly important since investors use information on the correlation of investment types in risk decisions and hedging. (Selmi, Kollias, Papadamou & Gupta, 2017)

This paper has the following structure. The ensuing section after the introduction presents the problem statement and paper objective, this is followed by a review of related empirical literature. Following the literature, the research method is presented; this is followed by the analysis and discussion sections. The final section of this paper is the conclusion.

2. Research Problem and Objective

Although there are evolving literature, which interrogates how bonds and shares are related both in terms of information flow and related prices; (Fama & French, 1989; Demirovic, Guermat & Tucker, 2017; Koijen, Lustig & Van Nieuwerburgh, 2017; Nieto & Rodríguez, 2014); but most of these research appear to concentrate on developed markets. Currently, investors across the developed or advanced markets are looking for diversification and investment in emerging or developing markets; they are thus desirous of information that relates to the developing markets and most importantly if such information also links advanced markets such

that it could portend comparability of stock and bond behaviours. Such research is not common amongst the current genre of related literature. It becomes therefore important to know if bond and share prices in a combined advanced and developing market data may have a semblance of relationship and what form of relationship, if any.

Therefore, the question that forms the crux of this paper is whether bond and shares in a fusion of advanced and developing market data have any relationship. Hence, the core objective of this paper is to present an analysis to examine the relationship between bond and share prices in a combined advanced and developing market bond and shares data. This paper adds to prior related papers that have looked into forms of correlation between bond and share prices and related market information such as information in the bond and share market (Kraft, Vasvari & Wittenberg-Moerman, 2011; Chen et al, 2016) and the bond and share price movement. (Campbell & Ammer, 1993)

3. Related Literature

Bonds and shares constitute important financial instruments for raising capital to assist businesses or government entities. (Puscaciu, 2015; Kafayat, 2014) The importance of the linkage, which subsists between stocks and bonds, constitutes an ongoing research in the financial market literature, mostly as the linkage might have potential assistance in the prediction of stocks and bond values. (Koijen, Lustig & Van Nieuwerburgh, 2017; Demirovic, Guermat & Tucker, 2017) Whilst comparing for similarity of shocks in bond and shares, Saadaoui and Boujelbene (2016) found a significant movement in volatility and shocks transmission in stock and bonds between the emerging markets indices and Dow Jones index. In terms of firm size and stock returns, Banz (1981) found that smaller companies are more disposed to having higher adjusted risk returns than large companies. It has also been asserted that business conditions have strong impact on bonds and share values. (Fama & French, 1989; Narayan, Thuraisamy & Wagner, 2017) Such conditions include inter alia the influence of energy price such as oil price on equity values. (El-Sharif, Brown, Burton, Nixon & Russell, 2005) In addition, the business cycle has been found to affect the bonds and share values by applying the three-factor dynamic no-arbitrage model. (Koijen, Lustig & Van Nieuwerburgh, 2017) In relation to this, there is an indication that uncertainty about corporate bond parameters could affect the trading volume of bonds and its prices. (Guo, Lien, Hao & Zhang, 2017) According to Narayan, Thuraisamy and Wagner (2017), there is a high level of consistent form of predictability between bond and equity. Researchers have also compared the flow of bond and share information. An apparent uniqueness of bond information is the gradual flow of information in the bond market against the flow in the stock market (Chen, Zhang & Zhang, 2016),

which has attracted the interest of researchers as this constitutes apparent uncertainty for investors in stocks and bonds.

In their analysis of the nexus between stocks and bonds, Koijen, Lustig and Van Nieuwerburgh, (2017) established a three factor model that explains the interconnection between stocks and bonds and found that stocks with much values react more to shocks triggered by bond variables. In a related study, Bao and Hou (2014) applied an extension of the Merton model to analyse the co-movement of bonds and stocks. Their findings indicate that, more than other bonds, late maturing bonds are more likely to exhibit a robust correlation with equities and that this relationship is more pronounced in firms with higher levels of imminent or potential credit risk. However, Adrian, Crump and Vogt, (2015) document a non-linear dependency between stocks and bonds.

Furthermore, market uncertainties emanating from credit risk.s and stock volatilities constitute influences, which might appear ambiguous between bond and shares. (Demirovic, Guermat & Tucker, 2017) Therefore, this means that the relationship between bond and shares could be conditional depending on asset values, credit risks volatilities and of course, on the willingness and robustness with which shareholders and bondholders are willing to transfer wealth. (Demirovic, Guermat & Tucker, 2017) In their related research, Chen et al (2016) analysed the effectiveness with which bond information could be disseminated in the market. They find inter alia, that lagged bond returns could be predicted for firms and industries, which are related in nature, especially those corporate with weaker bargaining prowess. In addition, Chen et al (2016) indicate that the bond market information has the propensity to travel more effectively than the information in the share market.

According to Amadeo (2017) there is a likely opposite movement between stocks and bonds with rising stock prices likely to cause a downward bond prices. Similarly, in a study on the conditional relationship between stock prices and bond prices, the DCC and Go-GARCH models were applied to analyse the correlation between emerging market stock prices and bond prices; results showed a negative and significant correlation. (Basher & Sadorsky, 2016)

Other researchers have paid attention to the correlation between bond and share returns. (Nieto & Rodríguez, 2014; Selmi, Kollias, Papadamou & Gupta, 2017) For instance, Nieto and Rodríguez (2014) analysed the relationship between share returns and bond returns from the same company. Using, the panel data approach, their findings indicate a higher correlation under a higher corporate financial leverage. In their study, Selmi, Kollias, Papadamou and Gupta (2017) applied the copula quantile-on-quantile regression and found an existence of substantial heterogeneity on the correlation between bond and stock returns.

However, whether the bond and share relationship holds true for a combined advanced and developing market stock and bond values is unpopular in the literature. This paper contributes to the literature by analysing the relationship between stocks and bond prices by combining an advanced country stock market and a developing country stock market using the Japanese and Kenyan stocks and bonds prices. The analysis is presented in the following sections.

4. Research Method and Analysis

An archival data for this paper was collected from the QuandL archives of stock market data for Kenya and Japanese stock markets (QuandL, 2017) Data was collected for a period of sixteen months, which were arranged in a cross-sectional panel data method, which produced a total of 32 observations. The Gretl software was used to conduct a regression analysis; the regression model is presented below. Prior research on equity prices have also applied the regression statistics. (e.g. Li, 2015; Fontana & Scheicher, 2016; Dimic, Kiviaho, Piljak & Äijö, 2016)

The Regression Model:

$$\gamma = \beta_0 + \beta_1\chi_1 + \varepsilon$$

Where:

γ = bond value

β_0 = intercept

β_1 = regression coefficient

χ_1 = Share value

ε = error (representing uncounted independent variables)

Test of Significance Level: the significance level for the relationship test is at an alpha (α) of 0.05 or 95 percent confidence level.

Hypothesis: H0: *there is no relationship between the share value and bon value in a combined advanced and developing market data.*

Decision: since the alpha level is 0.05, the null hypothesis is subject to rejection if the P-value is less than 0.05 ($P<0.05$), but the null hypothesis is acceptable if the P-value is higher than 0.05 ($P>0.05$).

5. Results & Discussion

Table 1. Fixed-effects Regression Result

Model 1. Fixed-effects, using 32 observations Included 2 cross-sectional units Time-series length = 16 Dependent variable: BondValue					
	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	352.393	27.6556	12.7422	<0.00001	***
ShareValue	-0.000614729	8.45323e-05	-7.2721	<0.001	***
Mean dependent var	210.6281		S.D. dependent var		181.9506
Sum squared resid	357096.4		S.E. of regression		110.9670
R-squared	0.652050		Adjusted R-squared		0.628054
F(2, 29)	27.17267		P-value(F)		2.25e-07
Log-likelihood	-194.5264		Akaike criterion		395.0529
Schwarz criterion	399.4501		Hannan-Quinn		396.5104
rho	-0.007265		Durbin-Watson		1.903295
Distribution free Wald test for heteroskedasticity - Null hypothesis: the units have a common error variance Asymptotic test statistic: Chi-square(2) = 2.00477 with p-value = 0.367002			Test for differing group intercepts - Null hypothesis: The groups have a common intercept Test statistic: F(1, 29) = 1.18146 with p-value = P(F(1, 29) > 1.18146) = 0.286011		

Table 2. WLS Regression Result

Model 2. WLS, using 32 observations Included 2 cross-sectional units Dependent variable: BondValue Weights based on per-unit error variances					
	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	339.621	25.8518	13.1372	<0.00001	***
ShareValue	-0.000591979	7.85391e-05	-7.5374	<0.00001	***
Statistics based on the weighted data:					
Sum squared resid	31.72236		S.E. of regression		1.028305
R-squared	0.654426		Adjusted R-squared		0.642907
F(1, 30)	56.81210		P-value(F)		2.10e-08
Log-likelihood	-45.26661		Akaike criterion		94.53321
Schwarz criterion	97.46468		Hannan-Quinn		95.50491

Table 3. Dynamic Panel Regression Result

Model 3. 1-step dynamic panel, using 32 observations Included 2 cross-sectional units H-matrix as per Ox/DPD Dependent variable: BondValue					
	Coefficient	*Std. Error*	*z*	*p-value*	
BondValue(-1)	-0.187527	0.0174993	-10.7162	<0.00001	***
const	13.7628	3.67941	3.7405	0.00018	***
ShareValue	-0.000484964	0.000121074	-4.0055	0.00006	***
Sum squared resid	633538.3		S.E. of regression		159.1902

The regression result in Tables 1 – 3 tested the hypotheses of no relationship between share value and bond value in a combined advanced and developing country stock market data. Tested at an alpha of 0.05, it can be seen from the result that the *P*-value is 0.001, which is less than the alpha of 0.05. This means that the results lie within the 95% confidence level. Worthy of note about the relationship is that the negative sign on the share-value regression coefficient indicates that an increase in share value might cause a decrease in bond value. This is a useful information for investors and market analysts. In addition, the data have a common error variance and common intercept as indicated in the test for heteroskedasticity and group intercept. This finding is similar to the finding of a causal linkage between equity and bond market in an entropy condition (Parker, 2017); but differ from Adrian et al., (2015) who found a non-linear dependency between stocks and bonds. Although Bao and Hou (2014) indicated a co-movement of bond and shares, but they highlighted that this would depend on certain characteristics at firm level. This paper is unique given that it combined the stock and bond data from an advanced and a developing country to conduct the analysis. It is also unique as it used three different panel regression techniques namely the fixed effect panel regression, the WLS panel regression and the DPD regression, which provided the same result.

6. Conclusion & Future Direction for Research and Policy

The main objective of this paper was to analyse the relationship between stock value and bond value in a combined advanced and developing country stock market data – using data from the Japanese and Kenyan Stock markets (representing an advanced country and a developing country stock markets) respectively. The pertinence of this paper draws from the paper's argument that research dealing on bond and share movement appears skewed toward the developed markets but little research focussing on a combination advanced and developing country perspective. This research bridges this gap in research and

knowledge by combining the bond and share values from an advanced economy stock market and from a developing economy stock market. The paper applied the panel data arrangement and used three different panel regression statistics to analyse the relationship namely the fixed effect panel regression, the WLS panel regression and the DPD regression. At an alpha (α) of 0.05, the resulting P-value from the three panel regression techniques was less than the alpha, which is $P<0.05$. The results also showed a significant but negative relationship between the share value and bond value, which indicates that increase in share value results to a likelihood of decrease in bond value. This provides an important new finding and thus a contribution to knowledge – showing that the stock and bond values might behave in a similar fashion in both advanced and developing market. However, more research is recommended, which would combine many developing countries" data with many advanced countries" data for further analysis. This paper is useful for bond and share investors, for stock market analysts and for the academia in case study teaching and research in the postgraduate classes such as in the MBA class.

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