TURKEY'S FOREIGN DIRECT INVESTMENT IN SOUTHERN AFRICA: A COMPARATIVE REGIONAL MACRO-RISK DATA ENVELOPMENT ANALYSIS

Master's Thesis

Garreth Tinodashe SHOKO

Eskisehir, 2017

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ABSTRACT

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In an international trade environment that has become more volatile as the volumes of trade increase, it has become imperative for investors to possess the most accurate and objective information provided in a timely fashion. This research aims to provide Turkish investors who are looking to invest in Southern Africa with a macro-risk classification of twelve countries of this region in direct comparison to Turkey for foreign direct investment (FDI) purposes. To reach this objective, we incorporated the macroeconomic variables which have been found to be statistically significant in influencing FDI inflows in most country risk assessment studies. These variables were divided into two groups which are inputs and outputs as mandated by the data envelopment analysis (DEA) method which we used for assessing the efficiency scores of the countries under study. Three DEA models were run namely Super BCC-I, Super BCC-O and Super SBM-V for the data on study variables from 2005 to 2012. We used DEA Solver Learning version 8.0 for running these models and the results showed that six countries out of the thirteen were averagely super-efficient on all the models thus we considered them as countries with the lowest macro-risk for FDI purposes. On overall Botswana was found to be the most attractive country for investing in but only for specific sectors. We then made recommendations on how best to invest in all the countries according to their achieved efficiency scores rankings.

Key words: Macro-Risk Analysis, Country Risk, Southern Africa, Foreign Direct Investment

FINAL APPROVAL FOR THESIS

This thesis, titled "**Turkey's Foreign Direct Investment in Southern Africa: A Comparative Regional Macro-Risk Data Envelopment Analysis**" has been prepared and submitted by **Garreth Tinodashe SHOKO** in partial fulfillment of the requirements in "**Anadolu University Directive on Post Graduate Education and Examination**" for the Master's degree in **Department of Business Administration (International Business)** has been examined and approved on **10/01/2018.**

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ÖZET

TÜRKİYE'NİN GÜNEY AFRİKA'DAKİ DOĞRUDAN YATIRIMLARI: KARŞILAŞTIRMALI BÖLGESEL MAKRO RİSK VERİLERİ ZARFLAMA ANALİZİ

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Uluslararası ticari riskler, dünya ticaret hacmi ile birlikte oransal olarak çok önemli bir artış yaşamaktadır. Bundan dolayı yatırımcıların piyasalara çıkmadan önce daha doğru, etkin ve objektif bilgi elde etmeleri zorunlu hale gelmiştir. Bu araştırma, Güney Afrika Bölgesine yatırım yapmak isteyen Türk yatırımcılara, bu bölgede seçilen on iki ülke ile Türkiye'nin bir makro risk kıyaslama imkanını sunmaktadır. Bu amaca ulaşmak için, çoğu ülke risk değerlendirme çalışmalarında, istatistiksel açıdan DYY girişlerini etkilemekte önemli olduğu tespit edilen makroekonomik değişkenleri dahil ettik. Bu değişkenler, çalışılan ülkelerin etkinlik puanlarını değerlendirmek için kullandığımız veri zarflama analizi (DEA) yöntemiyle, girdi ve çıktı olmak üzere iki gruba ayrılmıştır. Araştırmamızda 2005 ile 2012 yılları arasındaki çalışma değişkenleri verileri için üç DEA modeli, Super BCC-I, Super BCC-O ve Super SBM-V, uygulanmıştır. Bu modelleri çalıştırmak için DEA Solver Learning 8.0 sürümünü kullandık. Sonuç bize on üç ülkeden altı ülkenin tüm modellerde ortalama olarak en iyi etkinliğe sahip olduğunu ve doğrudan yatırım yapmak için en düşük makro riske sahip ülkeler olarak değerlendirebileceğimizi gösterdi. Genel olarak sadece belirli sektörlerde yatırım yapmak için en cazip ülke olarak Botsvana bulundu. En son olarak, bu bölgeye yatırım yapacak ülkelere, verimlilik puanı sıralamasına göre en uygun pazara girme stratejilerine dair öneriler yaptık.

Anahtar kelimeler: Makro risk analizi, Ülke riski, Güney Afrika bölgesi, Doğrudan Yabancı Yatırımlar

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…/…/ 2017

STATEMENT OF COMPLIANCE WITH ETHICAL PRINCIPLES AND RULES

I hereby truthfully declare that this thesis is an original work prepared by me; that I have behaved in accordance with the scientific ethical principles and rules throughout the stages of preparation, data collection, analysis and presentation of my work; that I have cited the sources of all the data and information that could be obtained within the scope of this study, and included these sources in the references section; and that this study has been scanned for plagiarism with "scientific plagiarism detection program" used by Anadolu University, and that "it does not have any plagiarism" whatsoever. I also declare that, if a case contrary to my declaration is detected in my work at any time, I hereby express my consent to all the ethical and legal consequences that are involved.

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(Signature)

Garreth Tinodashe SHOKO

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LIST OF ACRONYMS AND SYMBOLS

CRS	Constant Returns to Scale
DEA	Data Envelopment Analysis
DMU	Decision Making Unit
ERS	Efficiency Reference Sets
EU	European Union
FDI	Foreign Direct Investment
FDIS/C	Foreign Direct Investment stocks per capita (current $)
GDP/C	Gross Domestic Product per capita (current international $ 2017)
GD/GDP	Government Debt to GDP ratio
IDP	Investment Development Path
INF	Inflation rate (Consumer Price Index)
MHNDIS	Multi-group Hierarchical DIScrimination
OLI	Ownership, location and Internalization
TTP	Threat to property
TTRC	Total tax rate (percentage of commercial profits)
TRMI	Total reserves in months of import
TUSKON	Turkish Confederation of Businessmen and Industrialists
UACCIAP	Union of African Chambers of Commerce, Industry, Agriculture and Professions
UNTCAD	United Nations Conference on Trade and Development
USD	United States Dollar
UTA	UTilités Additives
UTANDIS	UTilites Additives DISscriminantes
VRS	Variable Returns to Scale

1. INTRODUCTION

Economic agents, beginning with individuals up to the sovereign states producing and consuming goods and services, are constantly trading with one another and trade and risk are inseparable phenomena. Logically the magnitude of the risk, actual or perceived, associated with trade is expected to be directly proportional with the value of the transaction. The twenty first century has been characterized by the continuous growth of international trade volumes, hence higher risks too. In their analysis of gains from globalization trade liberalization, (Federico & Tena-Junguito, Feb 2016, pp. 3;10-15) statistically show the growth of world trade and cite the importance of the rise of Asian countries especially China as contributing to today's undoubtedly high trade volumes in comparison to the first wave of globalization before the Napoleonic and World Wars.

Though the volumes of trade have been increasing at an exponential rate over the last two centuries, countries of the world have not contributed proportionally to this growth. It is not a secret that until recently, the United States of America (USA), Western European and Far East Asian countries have had the highest export of goods and services to gross domestic product (GDP) ratios (TheGlobalEconomy.com, 2016). This means they have been contributing most of what the world has been consuming especially manufactured consumer and industrial goods and technology related tertiary services. Dominance of international trade by a few players in the nineteenth and twentieth century hasn't deterred however the rise of new players in the twenty first century. Worth noting is the rise of Latin America, South Asia in general, South Africa, India, and more recently Turkey.

The significant participation of Turkey on the global market began after the Second World War with the adaptation of a nationalistic stance to development which led to the encouragement of only import substitution oriented policies. However the increasing balance of payment deficits and external debt crises led to the revision of the policies to more liberal export oriented ones (Hilmi & Safa, 2007, pp. 1-5). For a country which realized total exports of less than 3 billion US dollars in 1957, achieving 164 billion US dollars exports in 2014 shows tremendous improvement and this led to the improvement of the country's ranking to become the twenty seventh largest exporter

in the world. The country has however suffered continuous trade deficits over the recent years as imports have grown at a faster pace than exports making the country the twenty third largest importer in the world in 2014. (The Observatory of Economic Complexity, 2010). These developments in general show that Turkey has turned the corner and has become strength to reckon with on the international trade scene.

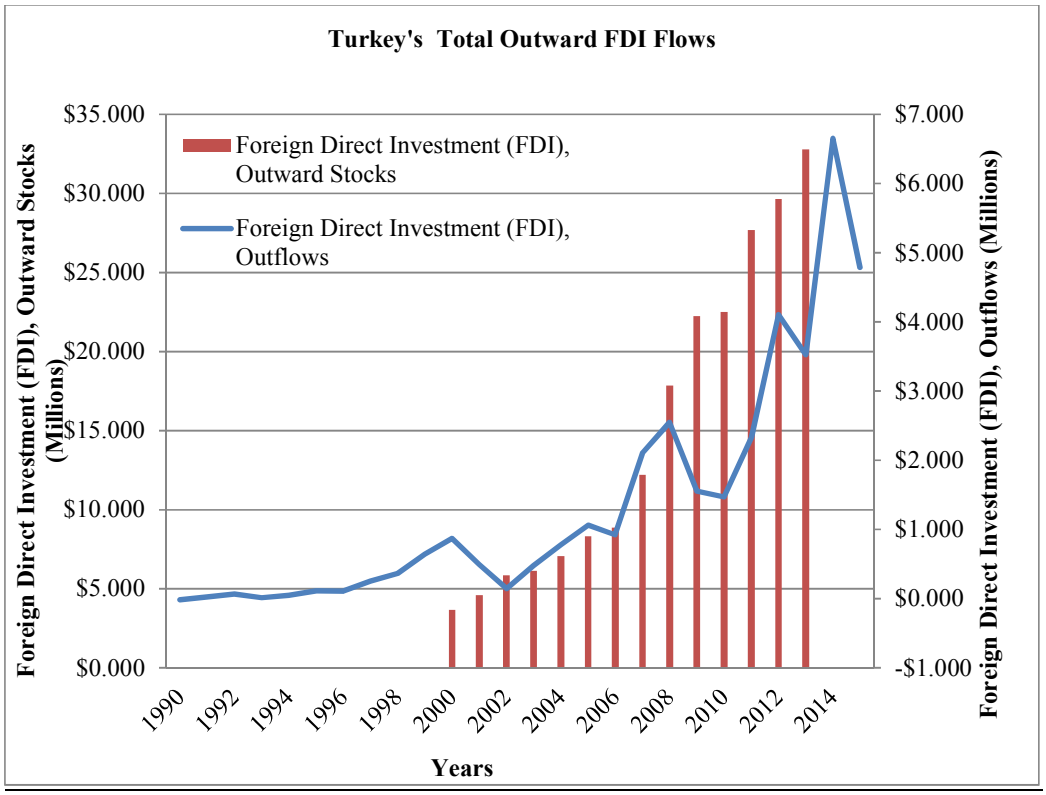
As is generally known trade within sovereign borders is marred with fewer complexities than that across the borders. The latter, on top of the locally encountered difficulties, introduces issues like exchange rate risk, trade restrictions, customs exercise, different languages, different legal frameworks, etc. It is such factors that then make it an imperative step for economic agents who decide to participate in international trade to do proper international market research which is dominated by country risk analysis.

After gathering intelligence on the foreign markets economic agents then decide whether to invest or not. Once the green light is given, decisions on the modes of participation in international trade are made. The most common modes of entry being direct exports, licensing agreements and foreign direct investments (FDI) (Carpenter & Dunung, 2011, pp. 382-385), this paper will be focusing mainly on the country risks associated with FDIs.

1.1. Overview of Turkey's Outbound Foreign Direct Investment

FDI has been a vital strategy for global growth for most countries especially in the second phase of globalization. Although Turkey does not rank the same as countries like Belgium, Switzerland, USA, Japan and China in terms of their volumes of outward FDI it has experienced an upward trend over the years notably beginning the year 2000. According to the Organisation for Economic Co-operation and Development, FDI flows refer to the value of cross-border transactions related to direct investment during a given period of time, usually a quarter or a year. Outward FDI therefore represents the value of transactions that the investors of a reporting country hold in foreign economies through purchases of equity and reinvestment of earnings less disinvestments and withdrawals of earnings (OECD, 2016). Figure 1.1 below shows the evolution of Turkey's outward FDI since 1990.

Figure 1.1.*Turkey's outward FDI trend since 1990; Data Source: OECD (2016)*



We can see that Turkey's outward FDI stocks increased by over 550 percent within 10 years from the year 2000. In 2014 the total was just below US $33 billion which is a significant improvement in comparison to just about US $3.5 billion in the year 2000. The annual FDI outflows, though showing an overall rising trend, reflect the impacts of the Turkish 2000-2001 banking crisis as well as the 2008 financial crisis.

The main targets of Turkey's FDI have been mainly the former Soviet Union countries (Örs & Ayanoğlu, pp. 5-6) but the analysis of mergers and acquisition deals up to 2014 show that the most favourable destination for outbound Turkish FDI remains Europe because of its proximity and favourable current Customs-Union (Deloitte, 2016, pp. 4-5). However according to the same report the most attractive region luring Turkish FDI remains North America.

1.2. Problem Statement

The Russia-Turkey sanctions that were briefly imposed by the former after the 24 November 2015 fighter jet incident is a contemporary politico-economic example of how the global market is more volatile than ever. In this example experts estimate that if the situation had not been rectified swiftly, both countries would expect their economies to shrink by significant percentages as the two are major trading partners. Turkey stood to suffer a decline in exports to Russia by a minimum of 25 percent and important declines in the construction and tourism sectors. (Demir, 2015, pp. 1-5) Today's international investment decisions thus reflect the influence of such volatility, especially the recently frequent financial crises, on the potential investors. The resulting high level of risk avoidance is more often translated with the application unbearably high risk premiums on capital.

For Turkish investors envisaging FDI to Southern African markets one of the important questions, to which differing responses can be given, is the sustainability of long term investments in the region. Limited resources will also require discriminatory investment according to credibly assessed economic potential, development and political stability. In short the investors will want to know the potential risks associated with the region. While there are credit rating agencies (CRAs) such as Standard and Poor's, Moody's, Euromoney, Fitch's and many more that can provide an insight on a country's rating against other countries of the world, their sometimes inconsistent conclusions and late reactions on important changes may leave an investor in a worse decision making dilemma.

1.2.1. Debatable issues on credit rating agencies (CRAs)

The confusion that relying on CRAs ratings can bring to a potential investor starts with the definition of the ratings and what they represent. In their assessment on bond rating confusion (Nomura Securities International, 2006, pp. 1-11) concluded that as long as rating agencies continue to use variable meanings for their ratings symbols, comparison of market risk will be extremely difficult for stakeholders. Past major market failures have led to 'ratings crises'[1] and at the top of the log will be the inability

[1] 'Ratings crises' is a situation of lack of confidence in CRAs and their ratings.

of these CRAs to predict the Mexican peso, Asian and the 2007-2010 global financial crises (Bahena, 2010, pp. 1-23); (Moore, 2016). According to the same sources CRAs have also been blamed for their failure to downgrade corporations like Enron and Parmalat Group which all went bankrupt yet there had not been any revision of their investment grade status as a warning sign of possible downfalls.

Besides verifiable incidents that have instilled doubt in some countries' investors on CRAs, the agencies have also been criticized for being too subjective in their degrading of certain countries as well as favoring the western world. Recently, Turkey's President Recep Tayyip Erdoğan took a swipe at Moody's for degrading the country's rating unfairly to junk status (Micklethwait & Yoon, 2016). Earlier the same year the Chinese Finance Minister Lou Jiwei (樓繼偉) had expressed the same sentiments towards S&P and Moody's claiming that their downgrading of his country's rating didn't match their constantly above average growth rate (Taipei Times, 2016). In addition to the above mentioned examples the European Parliament sat down to review the extent to which CRAs opinions had to be entertained and to determine their jurisdiction in the EU thus creating the CRA I& II Regulations (Klinz, 2010, pp. 1-11). The Brexit[2] move led to a one degree downgrading of Britain's Credit rating by the 3 major rating agencies. However this did not result in the expected increase of borrowing costs for the country, to which analysts suggest confirms a new pattern in which investors ignore the actions of rating agencies (Moore, 2016).

It is important however to reiterate that the main framework of most CRAs is a firm tool that is vital and widely used for investment decisions. However for a Turkish investor venturing into FDI rather than Foreign Portfolio Investments (FPI) in Southern African countries, simple credit ratings for these countries may be way too insufficient to base long term decisions on. It is for this reason that a selectively more objective macro-risk analysis for the region in comparison with Turkey be realized to have a clearer picture on the FDI attractiveness of the region. Of paramount is also the review of relations between Turkey and Africa so far to show the extent to which diplomatic foundations have been laid down to create a conducive business environment.

[2] Brexit is a portmanteau of 'British' and 'Exit' referring to United Kingdom's withdrawal from the European union

1.2.2. Turkey-Africa non-economic relations

Despite the fact that historical ties that existed between Turkey and mostly North and East Africa during the Ottoman Empire period maybe too farfetched a reference to foster 21st century relations, Turkey has recently taken giant steps towards fortifying its relations with the continent. According to the Turkish Ministry of Foreign Affairs, the 1998 Action Plan policy paved way to the much improved bilateral relations between Turkey and Africa. Diplomatic relations have strengthened ever since the declaration of the year 2005 as 'Year of Africa' and Turkey being accorded observer status by the African Union. In 2008 the latter declared Turkey as a strategic partner for the continent and in the same year also was the inaugural Turkey-Africa Cooperation Summit which was later held for the second time in 2014 in Equatorial Guinea. (Republic of Turkey,Ministry of Foreign Affairs, 2016).

Turkey-Africa political-economic relations have also seen the increase in the number of reciprocal representation of the partners. Of interest is the increase of Turkish embassies in Africa from just twelve in 2009 to thirty-nine (Republic of Turkey,Ministry of Foreign Affairs, 2016). The same way many African countries too have opened up embassies in Ankara following the increased number of African students who are studying in Turkey under different Turkish scholarship programs and increased business visits by African countries' representatives. Politically the region and Turkey have become close as Turkey has been part of several peace keeping missions and diplomatic dispute settlements at the request of the African Union. The region itself has pledged support for major Turkish foreign policy for example the strong support for Turkey's candidacy in 2008 for a two-year, non-permanent seat on the UN Security Council (Özkan, 2010, pp. 93-105)

As the third largest donor in the world in 2013 and 2014 (Republic of Turkey,Ministry of Foreign Affairs, 2016) , Turkey has done tremendous work especially in sub-Saharan Africa to the north. Through the Cooperation and Development Administration of Turkey (TIKA), which currently operates fifteen Program Coordination offices in Africa, the country has realized several humanitarian projects in the health, education, infrastructural and social development sectors. The African Union has also been receiving financial assistance of a million US dollars since

2009 there by reducing the burden on the union's limited budget (Republic of Turkey,Ministry of Foreign Affairs, 2016).

1.2.3. Turkey-Africa economic relations

China's 1990s expansion into Africa was viewed with less interest until this export giant became the major trading partner to the continent. Following almost the same blueprint Turkey has adopted a more aggressive and fast approach in bettering the economic relations with the region. By opening special Commercial Consulates in twenty-six African capitals and the establishment of business councils in nineteen sub-Saharan African countries by the Turkish Foreign Economic Relations Council (DEIK), Ankara has shown its firm intention to have long-term business partnership with the continent. In addition by 2016 year end the Eurasian country had signed Trade and Economic Cooperation Agreements with thirty-eight African Countries. (Republic of Turkey,Ministry of Foreign Affairs, 2016)

While trade on G2G[3] basis is necessary to show the good relations between sovereign states, it is insufficient to fully motivate potential small businesses with interest to invest in the partner abroad to commit on long term basis. To curb this possible deficiency The Turkish Confederation of Businessmen and Industrialists (TUSKON) has been instrumental in bringing potential partners together through its Turkey-Africa business summits and expositions. (Özkan, 2010, p. 102). Together with other related Turkish organizations such as DEİK; the Ministry of Foreign Affairs; Ministry of Economy and more, the country has partnered with several African agencies such as the Union of African Chambers of Commerce, Industry, Agriculture and Professions (UACCIAP) to allow participation of non-governmental potential investors. In the same role of facilitation of trade Turkish Airlines has been a major player too. With its numerous flight connections, in 2016 the company connected the continent to forty-eight destinations in thirty-one countries and this has contributed to the rise in the number of African tourists to Turkey and vice versa. (Republic of Turkey,Ministry of Foreign Affairs, 2016)

[3] G2G, Government to government relations in various departments.

These efforts have seen Turkey-Africa bilateral trade volumes increase to 17.5 billion USD, 2015 estimates. In comparison to the 2003 volume of just about 5.4 billion USD, this is a significant increase which has attracted the world's eye to the interests of Turkey in Africa. (Özkan, 2010, pp. 93-105). Turkish contractors have become important players in mega-projects in the continent especially in North-Africa and in total, 2016 statistics show that over 1 150 projects worth 55 billion USD have been realized (Republic of Turkey,Ministry of Foreign Affairs, 2016). A major macroeconomic contribution of these relations is the employment creation that has resulted. Turkey has joined China and India as the top employment creators in Africa's manufacturing sector (Diop, Li, Li, & Shide, 2015). According to The Africa Investment Report 2015, Turkey created 16 593 jobs in the continent via investments, making it the number one job creator in Africa for the year 2014. (The Africa Investment Report , 2015, p. 7)

Besides the major importance of the construction sector in the business relations, according to TUSKON, the other major sectors with potential for business with Africa include home textiles; packaging devices; iron-steel; durable house products and appliances. For Turkish importers, the main imports from the region are oil; raw materials and minerals. (Özkan, 2010, p. 102)

1.2.4. To what extent is Southern Africa actively participative?

It is undoubtedly clear that the relations between Turkey and Africa have been concentrated in North-Africa. The simple indication that one of the main stronghold sectors of the country, construction, has 21 percent share in comparison to other contractors in Africa yet 19 percent is in North Africa (Republic of Turkey,Ministry of Foreign Affairs, 2016), shows a clear indication of preference of this part of the continent. Understandably so, Turkey and the region have strong ties dating back to the Ottoman Empire and also the proximity of the region and its easier accessibility via the Mediterranean Sea makes it more favorable for trade. This phenomenon tends to conform to the gravity model of trade which emphasizes the importance of distance and history between two trade partners on their possible volumes of trade (Economywatch, 2010). However, beginning the 2000s Turkey has taken to include Sub-Saharan African countries as potential business partners and as can be explained using the same

aforementioned model, these efforts have been concentrated in Sub-Saharan countries to the north notably Somalia, Sudan and Ethiopia.

The most notable developments have happened between Turkey and the Republic of South Africa where according to (KARABOĞA, 2016), the amount of Turkish investments have exceeded US $600 million with a total of more than 100 companies operating in the country. In a reciprocal manner big companies like Arçelik and Dağıstanlı Holding have bought out major competitor companies in South Africa as the latter's companies like Met Air have also taken over companies in Turkey. The pair's export and import volumes are also the most significant compared to with other countries in the region with 2014 statistics showing total exports from Turkey being around US $ 545.3 million and imports from South Africa at US $1,189.4 million (DEİK, 2015). Of the remaining countries there still lacks strong evidence to suggest a strong presence of Turkish investments there. However in most of these countries plans have been laid out for the construction of hydroelectric power stations for example in Malawi, Zambia and Zimbabwe. In Namibia plans for construction of a nuclear central as well as transfer of technical expertise to exploit the diamond and uranium resources in the country have been cited by DEİK.

According to the trend shown so far, this region will most probably benefit the least from the Turkey-Africa relations for a while unless the business models especially on market intelligence and entry aspects are developed differently. Due to the proximity constraint between Southern-Africa and Turkey it is mostly difficult for potential multinationals in both regions to use direct exports and imports competitively especially with the bulky merchandise. Other options under licensing agreements may be regarded as better modes of entry to the region but the main constraints of capital availability in most African regions may result in reduced standards of the original products or service. For these reasons this study will focus on FDI as the main entry strategy to the region and other options will be incorporated according to the results of the study.

1.3. Significance and Objectives of the Study

Given the concentration of Turkish investments to the northern parts of the continent, this study presumes the familiarity of that part of the continent to Turkish investors. Equally, we presume that the opposite is true on the familiarity of the southern part of the continent to Turkish investors. The main objective of this study is therefore to provide a comprehensive guide, from a macroeconomic perspective, to the Turkish investors planning to invest on long term basis in Southern Africa. In addition to using ratings provided by CRAs, Turkish investors can refer to this study to gain an understanding on the region's macroeconomic risk in direct comparison with Turkey's similar macroeconomic indicators. This comparison and classification of the countries will allow for investors to choose the best location for their initial investments according to the needs of the planned business. Furthermore, modes of expansion into the other countries of the region and strategies of serving these competitively may be developed according to the various classifications made in this study.

The secondary objective of the study is to provide an improved method of country macro-risk analysis that is based on previously realized studies and models by consolidating the unanimously agreed upon approaches and eliminating the consistently challenged methodologies. The resultant approach may be used for other comparative studies linked to country analysis by other researchers. However the methodology adopted in the study is not developed as an exclusive stand-alone approach but rather as a complementary one to support existing ones thus helping investors make better choices from a wider perspective.

The further development of economic-relations between Turkey and Southern Africa will be based upon the ability of both parties to iron out differences and inconsistencies smoothly. The results and recommendations from this study may point out the pertinent major areas requiring immediate addressing from all concerned stakeholders. In addition, necessary precautions can be taken on delicate situations that may pose as unfavorable drawbacks on the relations. For example in a situation where a change in government may result in breach of contracts or non-performance, problem solving mechanisms can be premeditatedly installed to cater for the possibility.

1.4. Research Questions and Assumptions

While many a layman to country risk analysis would summarily conclude that Turkey and South Africa are most probably the best places to invest in among the countries included this study, they wouldn't be able to give solid reasons on why they made this conclusion nor determine the best forms of investment to the countries. Furthermore, the potential of the remaining countries and how far or close they are to having the same conditions as their first two preference, remains a mystery. This research serves to verify or correct the initial assumptions as well as bridge the gap between these and the reality on the ground. From this perspective, our study provides responses to the following questions:

Question 1: Which Southern African countries countries have more favorable environments for attracting FDI compared to Turkey and by what magnitude?

Question 2: Which Southern African countries have less favorable conditions for FDI compared to Turkey and by what margin?

Question 3: How best can investors enter the markets of countries answering questions one and two?

In answering these questions we have made several assumptions that allow us to compare the countries on an equal platform. The main assumptions made in this study are that:

Assumption 1: Except for superiority in any of the study variables there are no other advantages for Turkish investors to favor investing at home than abroad.

Assumption 2: The natural resources are ubiquitous and uniformly distributed in all the countries under study such that assessment is focused on the variables affected by government policies only.

1.5. Limitations of the Study

While this study is useful in giving an overall macro-risk outlook of several Southern Africa compared against each other and Turkey, its main drawback is that it cannot be used as a standalone tool by individual companies vying for FDI investments in the region. This is because a further company level micro-risk analysis needs to be

carried out, which will be more sector or industry specific to complement this study and therefore permit more accurate investment decisions.

In order to reduce the number of subjective variables, the use of objectively measurable proxy variables is supported in this study. However the use of proxy variables also means a possible deviation from total accuracy though it is by a lesser margin than using extremely subjective variables. In addition to this limitation, the selection of specific variables that are considered to be statistically significant in affecting FDI inflows means that other variable that are considered less important are omitted in this work. This however doesn't necessarily mean that they are non-existent on the ground thus from inclusion such variables, deviations from the initial results may materialize.

While the best way to approach the study would have been assessing Turkish FDI in Sub-Saharan Africa, the number of countries to have been included would be very high and would complicate realization of an elaborate analysis. Since there is not a universal definition of Southern Africa, the adopted definition is based on the economic integration community which is the Southern African Development Community (SADC). However, due to lack of official data on the study variables for some of the countries such as Lesotho and Swaziland, we sidelined these in the research as it would produce patchy results.

1.6. Definitions

Foreign direct investment (FDI): The widely accepted definition is that which was proposed by the IMF that an FDI enterprise;

"*…is an* enterprise *(institutional unit) in the* financial *or* non-financial corporate sectors *of* the economy *in which a* non-resident *investor owns 10 per cent or more of the voting power of an incorporated enterprise or has the equivalent ownership in an enterprise operating under another legal structure*." (Art Ridgeway Statistics, 2004).

The vital notion derived from the definition is the ownership of a substantial decision making power in the target firm. Its importance is also iterated in the definition of flows of FDI by (Froot, 1993) which he defined as cross-border expenditures aimed at the acquisition or expansion of corporate control of productive assets.

Southern Africa: Since there is not a universally accepted set of countries that are considered to belong to this region, throughout this study the countries that are part of the SADC are taken into consideration. This is because the development community has the jurisdiction to negotiate on behalf of the member countries on matters concerning the region. And instead of signing multiple bilateral agreements, Turkey can sign certain agreements with the regional economic community. The countries currently SADC members are Angola; Botswana; the Democratic Republic of Congo; Lesotho; Madagascar; Malawi; Mauritius; Mozambique; Namibia; Seychelles; South Africa; Swaziland; United Republic of Tanzania; Zambia and Zimbabwe. (Southern African Development Community (SADC), 2012)

Country risk: Though (Wilkin, 2004, pp. 1-4) acknowledges that a definition of country risk is dependent on business activity, he suggested that in the broad sense country risk is the probability of business loss due to country-specific factors. For (Topal & Gül, 2016, pp. 141-155) country risk is a type of systematic risk which is risks outside the control of the company. While most writers have adjusted the definition of country risk to suit their fields, (Kosmidou, Doumpos, & Zopounidis, 2008, pp. 1-2) emphasized the importance of adopting a rather wider definition rather than just an economic definition of (Cosset et al., 1992) which considers country risk as the probability that a country will fail to generate enough foreign exchange in order to pay its obligation towards foreign creditors. The multidimensionality of country risk is wholly accepted in this study so as to cater for an overall analysis applicable in the majority of sectors. Therefore political, economic and social variables that may affect FDI inflows are supposed to be taken into account.

Macro-risk analysis: When the risk is affecting just a particular sector or enterprise it is considered micro-risk. (Wilkin, 2004, pp. 2-6) For example new regulations on the import of telecommunication equipment should be expected to affect foreign companies in that sector only. When an incident or change affects all or most of the foreign companies then it qualifies as a macro-risk factor. For example calls for compulsory partial indigenization of all foreign companies. From this perspective, in this study country risk is used to refer to any macro unforeseeable occurrences, economic, political or social, that may result in the loss of ownership, operations, profits or the increase in operational costs of most of foreign owned enterprises in all sectors.

2. LITERATURE REVIEW

This chapter analyses the similarities as well as novelties of this study in comparison with previously studied topics of more or less similar nature. For a clearer picture of this research we first relate it to the basic theories of FDI and determine the closest explanations that are linked to the phenomena under study. We then go on to look at methodologies previously used to assess the attractiveness of a country for FDI at macro-level as well as the deficiencies that those approaches comparatively carry. Finally we assess the different situations to which our adopted methodology was applied and appraise the effectiveness of the approach.

2.1. Empirical Literature on FDI theories

As a dynamic subject that has been approached from different countries' perspectives, the attempts in explaining empirical FDI phenomena have yielded way less unanimous conclusions on its nature and processes. However the developed theories have paved way for realization of better ways of explaining it. Commencing with Mundell's explanation of differences in capital rentablity which suggested that in a perfect market, capital flows tend to increase towards countries with more gains on capital employed (Castro, 2000, pp. 23-25), we realize that though the returns on capital theories didn't stand for long as an explanation of FDI they introduced the importance of possible differential returns on investment that maybe realized by deciding to invest abroad. This is true in the case of Turkey and its investments in the whole of Africa in general where firms in industries such as construction may be able to strike more attractive contracts in host countries than at home countries because of factors such as possible low competition in the destination countries for such sectors. Scholars like Hymer in his 1960 thesis and Kindleberger in 1969 pointed the non-existence a perfect market as the main deficiency of this theory for justifying FDI as differential rates of return on capital may be exploited through other forms of portfolio investments (Castro, 2000, p. 15).

Traditional theories of international trade explaining why firms engage in trade across borders have been closest to explaining FDI through an expansion of the Heckscher-Ohlin (H-O)model of factors endowments (Katsioloudes & Hadjidakis,

2007, pp. 76-78). In the model countries produce products whose factors of production are abundant and use the surpluses to acquire the goods and services they do not produce as efficient through trade. Mundell expanded this model to explain capital movement across borders by suggesting that, in countries with stringent government restrictions on trade, transfer of factors of production to that destination would be a substitute and given easy mobility of capital among other factors, capital flows result in FDI (Castro, 2000, pp. 23-25).To a greater extent similar to this explanation was Kojima's explanation on Japanese investments in other developed countries. Emphasis of both approaches is on the foreign exploitation of home country advantages that can only be efficiently exploited in another country. From this view Turkish firms may invest in industries in Southern Africa in which they possess a competitive edge only abroad rather than in Turkey. An example would be an expert diamond cutting and polishing firm locating in that region instead of Turkey. However, just as the capital theory, most traditional trade theories cannot justify FDI as the only efficient means of entering this foreign market.

In an imperfect global market[4]the creation of a competitive edge by a firm can be the determinant of either its success or failure. The Hymer-Kindleberger hypotheses postulated that since foreign firms engaging in FDI are usually at a disadvantage compared to host domestic firms, the former has to possess an advantage unique to the local firms that will allow them to be competitive and this will be their success key factor in the host country (Nayak & Choudhury, 2014, pp. 4-6) (Castro, 2000, p. 23). For Kindleberger these monopolistic powers can be in any form ranging from patents, brand names, exceptional management, marketing, cheap sources of financing or superior technology (Nayak & Choudhury, 2014, p. 5;6). The Internalization approach of Buckley and Casson (1976) improved the initial hypothesis into a better explanatory tool for FDI by illustrating the advantages of a firm exploiting market imperfections without losing its monopolistic power which may result through other forms of market entry. The product cycle model by Vernon explained the importance of innovation for U.S firms which because of their superior technology managed to have an edge to serve their local markets as well as invest in other developed countries with less sophisticated

[4] Notion of imperfect markets on an international scale where there is either no full disclosure, there are barriers to entry or exit or there exist market manipulation by one or a group of agents.

innovations. In these aspects Turkish firms possessing diverse monopolistic advantages, especially the support of the Turkish Government to encourage investments in Africa, may exploit this opportunity and have a head start on potential competitors in the region.

While the possession of unique critical success factors when entering a foreign market is undoubtedly paramount for investors, Dunning's eclectic paradigm (Dunning & Narula, 1993, pp. 3-12) further suggest that these ownership (O) advantages should be accompanied by internalization (I) of these such that the company exploits them on its own without evoking the use of intermediaries to exploit on their behalf and there should exist location (L) advantages to realize production in a host country rather than at home. Without the combination of these 3 factors Dunning suggested there would be no reasonable explanation for starting international production rather a firm should preferably settle for exporting or licensing to service its foreign markets (Dunning & Narula, 1993, pp. 3-12). In its strict sense the model may fail to explain FDI flows between 2 countries possessing the same levels of technology and producing the same product and both dominant in their home markets. To cater for this possible inadequacy Dunning later acknowledged the importance of management strategy in determining whether to start foreign production or not even if all the OLI factors are present (Castro, 2000, pp. 21-23). In this study the variables that will be analyzed attempt to identify the relative potential favorable location for FDI at macro-level. However ownership and internalization advantages are rather more significant at firm level analysis so this dimension is thus not exploited in this volume.

Aligned to Dunning's suggestion of the importance of management strategy in FDI decisions is Knickerbocker's oligopolistic reaction theory (1973). He suggested that firms' decisions to invest abroad were not only determined by their internal strengths or the attractiveness of the potential host country but by the behavior of their competitors too. According to this theory, firms consequently tend to imitate their competitors' investment strategies as the Coca cola-Pepsi rivalry has proved over the years. The same phenomenon can be extended to country level to explain several sovereign governments' decisions to support their domestic firms in their international ventures particularly in terms of improving trade relations through bilateral agreements.

In this regard Turkey has developed embassies and consulates in most African countries just as China and so has the latter followed Turkey's move to create an industrial park in Ethiopia (Koigi, 2017). Such competitive strategic moves are considered by most as a way to strengthen a firm's position but for Dunning these can also be used to weaken the competitive position of competitors. Reference to this theory in this work is aimed at supporting the idea that since other countries are investing heavily in Southern African countries like Mozambique and South Africa there is need for Turkish firms to strategically increase their investments too in the region and this study attempts to point out the best localization.

The Scandinavian School with the well-known Uppsala model of internationalization had a dynamic approach to the process of FDI. The most agreed upon proposition was the process of incremental knowledge on which a company's ability to invest successfully in international production was based. This knowledge is regarded to be mainly acquired from a firm's past experience. Wheeled to this necessity is the size of the potential markets and the firms' psychic distance to the potential host country (Castro, 2000, p. 26) (Tykesson & Alserud, 2011, pp. 8-9;32;54). Reference to this school of thought is mainly linked to the importance of psychic distance. It was described by Johanson and Vahlene 1977 as 'the sum of factors preventing the flow of information from market to market'. Hymer described the advantages of domestic over foreign companies entering a new market especially with regards to market information. To overcome this obstacle the Uppsala model suggested the reduction of psychic distance by investing first psychically close countries, gaining links and experience in these and then later move outward to other regions. This approach to a greater extent complements the ideas of the gravity model (Krugman, Obstfeld, & Melitz, 2010, pp. 12-13). While most outward FDI from Turkey is targeted to the geographically close Eurasian countries, investments in North-Africa are a cornerstone in reducing the original psychic distance between Turkey and Southern-Africa which is why reference to the theory is important. The main limitation of the model however is its failure to explain the formation and existence of successful born-global firms (Pereira, 2015, p. 7).

Developed as a dynamic approach to the Dunning OLI paradigm, the Investment Development Path (IDP) is the approach most consistent with the perspective of this study as it has a more macroeconomic scope than the prior approaches (Nayak & Choudhury, 2014, p. 11).The IDP magnifies the importance of the relation between a country's level of development which is proxied by levels of GDP per capita and its investment position proxied by net outward FDI stock per capita (Castro, 2000, pp. 29-30). The inclusion of the macroeconomic metrics translates the importance of central governments' policies in creating attractive environments for incoming as well as managing outbound FDI. According to Dunning the first phase of IDP is the pre-industrial state of a country characterized by very minor inward FDI (concentrated mainly in primary resources extraction) due to the low development of the market in terms of unskilled labor, inadequate infrastructure and low demand among others. Outward FDI at this stage is negligible and the role of governments will be very high in trying to improve its infrastructure and human capital (Dunning & Narula, 1993, pp. 1-8).

The efforts by the government in stage 1 provide a foundation for improved location advantages which in turn lure foreign firms to invest. The notable improvements are better infrastructure, an emergent domestic consumer goods market and increased agglomeration advantages (Dunning & Narula, 1993, p. 12). For Dunning this is the stage at which local companies start having some ownership advantages in the primary materials extraction sector but the labor intensive manufacturing and other tertiary sectors remain open enough to allow FDI oriented firms to exploit. The governments of the host countries still have an enormous task of further improving the infrastructure and promoting the development of local firms' ownership advantages thus allowing them to start investing in adjacent territories (Castro, 2000, pp. 30-31). Stage 2 is therefore characterized by more inward FDI and a still small but increasing amount of outbound FDI.

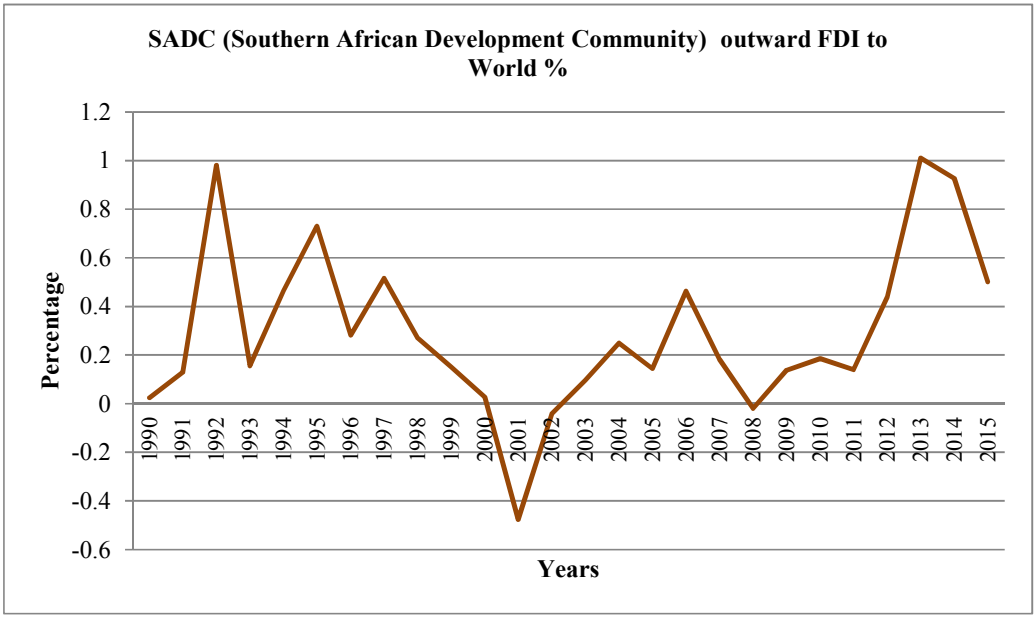
Countries in stage 3 of the IDP have domestic firms which have built considerable ownership advantages especially in labor intensive industries. Accompanied by now relatively higher wages which increase the production costs of operating in the country, the related sectors will experience reduced inward FDI as firms search for new stage 2

countries. The domestic firms with the developed ownership advantages will now be capable of servicing the larger domestic market with less aid from foreign firms. With these same O advantages the domestic firms become compeers with potential inward FDI firms thus rendering them legit to compete with the former in less developed markets. However other sectors remain not internalized by local firms and the inward FDI that will come in to exploit the void will mainly be from stage 4 and 5 countries specializing in complex technology goods. Governments of these countries in a bid to further smoothen the markets promote inward FDI in the less exploited sectors as well as incentivize the domestic firms to invest abroad with marketing seeking FDI in sectors they have become experts (Dunning & Narula, 1993, pp. 14-18).

In the IDP stage 4 the countries are majorly outward investors with mainly efficiency seeking FDI as well as strategic asset acquiring FDI in stage 3, 4 and 5 countries. The goods mainly produced are capital and knowledge intensive goods. There is some inward strategic asset seeking and market seeking FDI received from countries in stages 3 and 5 of the cycle (Dunning & Narula, 1993, pp. 14-18). Stage 5 countries are more or less the same as stage 5 countries and according to Dunning alone the balances of inward and outward FDI fluctuate around zero because of exchange rates and economic cycles in the short run (Castro, 2000, pp. 33-35).

The IDP is an essential tool in explaining why Turkey should be interested in investing in other relatively less developed regions. Considering the low levels of GDP per capita and the low levels of outward FDI from Southern Africa to the rest of the world, which have continuously been oscillating between 1 and -0.6 percent from 1990 to 2015 as shown in figure 2.1, we can strongly suggest that most countries of the region must still be in IDP late stage 1 or in stage 2 completely. Since South Africa ranked 4th on the top investors in Africa in 2015 (The Africa Investment Report , 2015, p. 14), the deduction of her contribution to this petit percentage will reinforce this drawn conclusion. Countries in these stages therefore present potential exploitable sectors in labor intensive manufacturing as well as tertiary sector ventures which other countries like China have already started exploiting.

Figure 2.1. *SADC (Southern African Development Community) outward FDI to World percentages. Source: Knoema Database 2017*



An analysis of the manufacturing industry in Turkey by Deloitte in 2014 showed the manufacturing sector contributed 24.2 % to the country's total GDP and the estimates for 2017 were even higher (Deloitte Turkey, 2014, p. 11). Such an important contribution strongly suggest the presence of ownership advantages for domestic firms and the growth of exports of manufactured products also confirms the strengthening of this position. However the manufacturing sector is not completely dominated by domestic firms thus leaving a window of opportunity for inbound FDI particularly in capital intensive good. These conditions together with the Turkish government's patronage in the sector's development place Turkey in stage 3 of the IDP. Therefore investing in IDP stage 2 countries with efficiency seeking and market seeking FDI while investing in stage 4 and 5 countries with strategic asset seeking and market seeking FDI should be the expected phenomena.

2.2. Country Macro-Risk Assessment Methodologies.

Prior to determining a country risk assessment methodology for factors affecting FDI flows, it is necessary to establish the various variables that are significant for inclusion in the study. As a critical stage but without unanimously agreed upon criteria for variable selection, it's the initial divergent point for ensuing results. However most

of the literature on the subject has been tackled using regression analysis hence the cherry-picking of supposedly relevant metrics. A study by (Hayakawa, Kimura, & Lee, 2011, pp. 8-9), synthesized most empirical works on determinants of FDI and using regression equations analyzed the importance of various political and financial risk variables in explaining a country's inward FDI. The study concluded that socioeconomic conditions, investment profile and external conflict were the most influential factors for FDI flows and that besides exchange rate stability yields other financial risk components were not statistically significant. The sample of 93 countries, developed and developing, makes the work more representative of a possible general phenomenon. On the other hand encompassing countries of different regions and varying development status in the same sample may lead to detrimental errors in decision making when some less developed countries' unfavorable positions are muffled under developed countries'. Dependency on the ICRG ratings in the estimation equations incites similar questions on the outcomes as those placed on mainstream credit rating agencies. Our study doesn't directly include any ratings obtained from similar agencies.

The problem of dependency on rating agencies issued measures in determining country risk was tackled with remarkable success by the non-recursive regression model proposed by (Alexe, Hammer, Kogan, & Lejeune, 2003, pp. 7;11-13). A sample of 69 countries was used in the study. Their main aim was to develop a model for country risk estimation which was non-recursive in nature, stable and highly correlated with other existing ratings from reckoned institutions. By fitting data into their proposed multiple regression model and cross-validating it using the *k*-folding, they managed to conclude that the model was highly consistent with Standard and Poor's, Moody's as well as The Institutional investor. While it is undoubtedly one of the most transparent models to be developed in the study of country risk, its sample of 69 countries only included a single African country which makes it difficult to apply as a standard for a study mainly focusing on the continent. Furthermore country risk ratings produced by the giant institutions are not necessarily a one-size-fits-all reference measure for all types of interactions with a country and thus high correlation with their ratings doesn't guarantee the fitness for purpose of the rating. Our study therefore is more specific in nature on

the purpose of which rankings are established, which is macro risk in the perspective of FDI attractiveness of a specific region.

Since it is a multicriteria problematic, country risk has to be approached using models that can synthesize multiple criteria into one conclusion. One such statistical model is the discriminant analysis model developed by Fisher in 1936 and has been widely used for classification problems. The notion of the method is to determine the best linear combination that can be used to discriminate between choices with minimal classification error possibility; given that the data used follows multivariate normal distribution and that the variance-covariance matrices for each group are equal (Kosmidou, Doumpos, & Zopounidis, 2008, pp. 44-47) (Bouchet, Clark, & Groslambert, 2003, pp. 115-116). Classification however requires prior determination of categories to which analyzed units will belong after classification. This condition renders it difficult to achieve pinpoint accuracy when discriminating between countries of similar historic, economic and political structures such as most SADC countries which may result in elements overlapping from one group to another hence a larger zone of ignorance. Addressing the problem of linearity of the discriminant model are the logit and probit models with the former employing the logistic function and the latter a cumulative probability density function of the normal distribution. The use of dichotomy distinction of variables however oversimplifies the complex nature of variables used in this study hence increasing the probability of inaccurate conclusions (Bouchet, Clark, & Groslambert, 2003, pp. 117-118).

Among various decision making tools that have been developed, the *Utilités Additive* (UTA) laid the foundation for most utility based decision making models. Developed by Jacquet-Lagrèze and Siskos in 1982, it provides a way to classify alternatives either by aggregation or disaggregation using linear programing techniques. The global utility of each alternative is calculated by summing up the weighted marginal utilities of all criteria or variables and constraining the values to remain between 0 and 1 (Siskos, Grigoroudis, & Matsatsinis, pp. 2-8). The Utility Additive Discrimination (UTADIS) and the Multi-group Hierarchical Discrimination (MHDIS) are variants of the UTA which have been applied in country risk assessment by (Kosmidou, Doumpos, & Zopounidis, 2008, pp. 33-43;63-64;92-94). Conducting their

study on a sample of 66 countries from different parts of the world, 2 of which are included in this study, their research intended to categorize countries according to their global utilities derived through the additive utility model based on UTANDIS. 12 variables were included, 10 of which were different economic indicator covering GNP per capita, exports, imports, reserves as well as external debt. They also included the Euromoney political risk rating and life expectancy as a measure of social development. The result achieved showed a 100% classification accuracy of the model with regards to the predefined World Bank and Euromoney categories. They also used a similar approach in developing UTANDIS II and III for accuracy comparison purposes with other methodologies such as the discriminant analysis.

While the approach is transparent and mostly objective, the use of only Euromoney political risk ratings in all the models renders possible speculation on bias towards the group's ratings. This raises the question of whether using another political ratings group such as PRS could have achieved the same accuracy or not. Furthermore the study was more inclined to measuring the creditworthiness of countries which may not translate into its attractiveness for FDI. After calculating the global utilities which synthesize the different variables into one compound, it becomes difficult to decipher sources of strength of each and every country thus making policy making for adjustment difficult.

Other non-statistical approaches have been utilized in the analysis of country risk and FDI attractiveness especially through consultation of experts and trend analysis. One such methodology was used by (Wentworth, Schoeman, & Langalanga, 2015, pp. 1-8) in analyzing the possibility of attracting what they referred to as sustainable investment into Southern Africa. The objective was to appraise the legal structures of various member countries in terms of their capability to attract FDI that can contribute to social development of the host countries as well as be in harmony with the black empowerment policies which have become the new phenomenon especially in South Africa and Zimbabwe with high potential of spreading through the region. They also used the World Bank Gini index to analyze inequalities in each of the countries and to determine areas to which FDI attraction should be focused. While it is one of the closest works to analyzing Southern Africa's FDI attractiveness the lack of a

standardized methodology that can be used for a country to country comparison for any other region of the world and the use of an immeasurable criterion in analyzing the legal framework makes it a complex methodology to apply in this volume.

EY's attractiveness survey can be considered one of the most complete analyses of Africa's FDI attractiveness. The surveys are conducted on both actual attractiveness, measured by the values of FDI projects embarked on by investors and the actual fluctuations of FDI in various sectors. It also incorporates perceived attractiveness which is based on experts' opinions of the past events and how they are expected to shape the future landscape for FDI in the continent. For instance in their 2015 survey their inquired on the perceived barriers to FDI growth and most investors cited the unstable political environment as the major cause for concern followed by corruption and weak security (EY, 2015, pp. 31-34). The surveys are very instrumental in providing unique information on FDI that is not readily available on governments issued information sustained databases. Regular survey reports keep up with the dynamism of the matter and thus can provide an up to date overview of investments in the region. However the issued reports tend to focus mainly on major projects launched and major changes in sectorial investments and tend to ignore analysis of variations of lesser magnitudes. Therefore a difficult to fill data vacuum would be created if this research was entirely based on EY's surveys.

2.4. Application of Data Envelopment Analysis

Performance measurement concepts can be applied on any activity, process or event and as such there are also several methods used in its evaluation according to the variance of the nature of the problematic. Data envelopment analysis (DEA), owing to its distinctive formula, has since its first article in 1978 been applied in various situations and the literature explaining its applications is vast. (Ramanathan, 2003, p. 136). However since this paper contains a unique application of DEA on countries and measuring non-production performance we explain the logic of our approach using literature that has been created on closely related topics.

The most related, purpose useful article was realized by (Golany & Thore, 1997, pp. 191-204) and their work has been one of the major references on social development

related DEA articles. Their work was done rating a sample of 72 developing and developed countries by their economic and social performance for the period of 1970-1985 and they drew conclusions based on increasing, constant and decreasing returns to scale to determine long run growth or decline the countries' state. Their use of common economic performance metrics such as GDP, real domestic investment ratio to GDP, government expenditure and consumption as input and output criteria in their DEA model makes it a major contributor to sovereign level DEA based performance appraisal literature. Our approach takes the same dimension of using macroeconomic indicators as basis for rating countries. Most unique from other similar approach adopting researches, is the fact that we use the calculated rankings as proxies for measuring the effectiveness of a country in creating a good FDI environment rather than as just an indication economic or social advancement. Another difference is that while their work as most makes comparison on rather random developed and developing countries globally, our work is specific on comparing members of a uniform region, with the exception of Turkey, which makes comparison and drawing conclusions more meaningful than comparing totally different countries subjected to totally different historical background and socio-political cultures.

Having a nearly similar approach to (Golany & Thore, 1997, pp. 191-204) is the research on the implications of a country's competitiveness on human development by (Ülengin, Kabak, Önsel, Aktas, & Parker, 2011, pp. 16-27). The research paper was realized taking a sample of 45 countries and DEA applied to rate these countries using global competitiveness indicators as input and output variables. They related high competitiveness of a country to enhanced human development which is not analyzed in our paper. However their work reinforces the idea of applying global metrics to distinguish between countries' effectiveness in producing a non-physical output using DEA methods. In a research by (Nordin & Said, 2011) on 54 members of the Organization of the Islamic Corporation, variables including inflation, GDP and unemployment were incorporated in an output oriented DEA model to measure the macroeconomic efficiency of these countries for the period 2003-2007. The main similarity with our study is the use of macroeconomic variables at country level in DEA models.

Haphazard selection of countries to analyze is, as previously mentioned, a possible source of incorrect conclusions when totally different countries are being analyzed. In a macroeconomic performance evaluation perspective (Staníčková, Melecký, & Všb-Tu, 2012, pp. 145-156) used DEA models to evaluate Visegrad[5] countries individually as well as 35 sub-regions and comparing their performances according to their efficiencies. They emphasized that Visegrad (V4) countries have identical features, similar historical and cultural backgrounds and interdependent economic relations that make their efficiency appraisal produce objectively comparable results. In their assessment they used some European Union (EU) growth strategies indicators as gross domestic expenditure on research and development, employment rate, number of students by tertiary education, labor productivity and GDP in purchasing power standards and labor productivity per person employed. After separating these variables into inputs and outputs they applied the CCR, BCC and SBM DEA models and averaged the results to obtain average country and region rankings. Since they analyzed data from 2000 to 2010, the obtained results were considered to be a mirror of performance or rather a reflection of development potential of the analyzed DMUs. We adopt a similar approach in which we analyze a region with similar characteristics and rank the efficiencies of the member countries plus Turkey according to selected macroeconomic indicators for a specific period and use the results as a reflection of the comparative attractiveness of these countries for FDI purposes. The major differences between the works include difference in region analyzed, variables selected and period of analysis.

[5] Visegrad is the group of countries whose current members are Poland, Czech Republic, Hungary and Slovakia.

3. METHODOLOGY

3.1. Overview

According to (Kosmidou, Doumpos, & Zopounidis, 2008, pp. 15-17) the most familiar techniques in country risk analysis have been regression analysis, discriminant analysis, logit and probit analysis or principal components analysis based. Data envelopment analysis (DEA) which is a decision making tool based on linear programming (Martic, Novakovic, & Baggia, 2009, pp. 37-43), is however a more popular tool in operations management. Originally it was developed by Charnes, Cooper and Rhodes in 1978 as a benchmarking technique for evaluating performance of non-profit making and public entities (Sherman & Zhu, 2006, pp. 49-89). Its name is derived from the fact that after determining the most efficient units the plotted curve will envelop all the other efficiencies under it with the most efficient units being on the slope itself. This study applies the technique with the objective of obtaining more meaningful decision making infomation that can point out well performing units and their comparative main strengths as well as variables requiring improvement for each country.

In DEA literature the units that will be under evaluation are referred to as decision making units (DMUs) which can be any entity regardless of the nature of products or services produced or underlying processes (Martic, Novakovic, & Baggia, 2009, pp. 37-43). In this study the DMUs under analysis are Turkey and SADC countries with the exception of Lesotho, Swaziland and Seychelles. Unlike regression analysis and production functions, DEA is a non-parametric approach and as such no assumptions on functional form (Martic, Novakovic, & Baggia, 2009). Rather DEA makes use of the observed data and through a string of mathematical programing generates relative weights from it thus reducing the bias associated with *a priori* weights allocation. After the relative weights are applied to all units, relative efficiencies are allocated to DMUs and the differences between efficient units and inefficient units are determined (Sherman & Zhu, 2006). Furthermore, for all inefficient units the closest efficient units to which they are most directly inefficient are determined and they are referred to as efficiency reference sets (ERS).

3.1.1. The notion of efficiency

The term efficiency is commonly a performance measure to determine the best results an entity can obtain for given amount of resources. According to (Cooper, Seiford, & Tone, 2007, p. 1;2) performance is usually measured using the productivity ratio:

$$\frac{\text{Output}}{\text{Input}}.$$

They also emphasize on the description of the above ratio as rather a partial productivity measure, when it takes into account a single input and output, so as to distinguish it from total factor productivity measures. The same ratio is described by (Sherman & Zhu, 2006, pp. 49-53) as the simplest definition of efficiency to which more output per unit of input reflects relatively higher efficiency. Since it is impossible to determine the absolute efficiency each country can achieve in providing an attractive environment for FDI investments we can only determine the best practice frontier that will be representing the most conducive countries in terms of the selected FDI inflow determinants. As illustrated by (Cooper, Seiford, & Tone, 2007, pp. 2;13-14) (Sherman & Zhu, 2006) (Zhu, 2014), partial efficiency calculation are relatively easy but DEA becomes an undoubtedly superior tool to most when multiple inputs and outputs are concerned.

Rating of efficiencies of real production DMUs is first impression most readers may have but this study considers the less exploited application of DEA models which rates non-production DMUs. This means efficiency in this study doesn't represent how well a country creates the outputs using inputs but rather a country on country benchmark measure, considering the country with the most favorable combinatory levels of the selected variables as the best practice DMU. In other words the countries with the higher efficiencies are considered to be comparatively more suitable for FDI which approximates to them having lower macro-risk.

3.1.2. Inputs and outputs concept

More often than not inputs and outputs are associated with the production function where the inputs are the resources put together in order to achieve a certain goal which

is the output. However as (Zhu, 2014, pp. 49-51) clarified, in using DEA as a benchmarking tool inputs and outputs can be performance measures, metrics, factors, outcomes or indicators. In this study, the DMUs under study are countries whose macro-risk, proxied as attractiveness for FDI, is being assessed by analyzing their performance on each of the indicators found to be statistically significant in influencing FDI inflows in developing countries by other researchers. As such the indicators to be analyzed make up the inputs and outputs of the benchmarking model.

DEA models minimize inputs and maximize outputs (Zhu, 2014). We use this axiom to classify our performance indicators as either inputs or outputs. This means that all indicators that are favorable when they are lower such as inflation, government debt or instability ratings are consequently inputs that seek to be minimized if a DMU is to be considered favorable for investment. Equally true is the opposite where, outputs are the indicators for which the higher the measure the more preferable the DMU. Thus performance indicators as GDP per capita, FDI stocks and foreign currency reserves are examples of outputs in this volume.

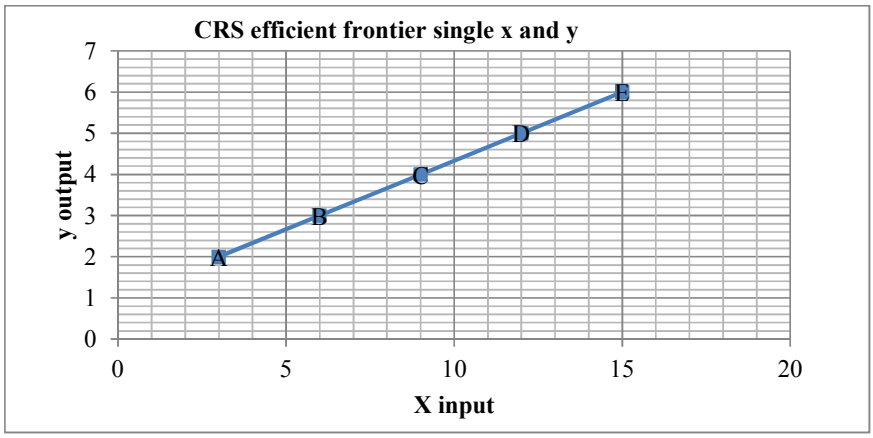
Of equal importance to categorizing inputs and outputs is determining model orientation, that is whether input oriented or output oriented, also known as input minimization and output maximization respectively. Input oriented models intend to minimize the inputs without changing the levels of output while output oriented models target the increase of outputs without changing the levels of inputs (Gomes et al.,2012). Benchmarking DEA mostly uses input oriented model but this study will analyze both. Initially input oriented analysis, to identify the countries most efficient in keeping unfavorable indicators to the minimum and then output oriented modeling to show the countries efficient in achieving very high levels of designed output indicators regardless their inputs levels.

3.2. Mathematical Formulation of DEA Models

The simplest of DEA formulae is the CCR named after its pioneers Charnes, Cooper and Rhodes. It assumes that for given DMUs the inputs and outputs are related proportionally hence suggesting the existence of constant returns to scale (CRS) (Gomes et al.,2012 pp.113-132). Due to the restriction that this formula cannot take

negative inputs or output it is complex to utilize in our study since we have inputs that can possibly take negative values, for example in a case of deflation in a particular year. However since other advanced models use the foundations of this original, referred to as the primal, it is paramount to mention its basic structure. Most DEA models are derived from the weighted sum of outputs to the weighted sum of inputs ratio.

Figure 3.1. *Illustration of constant returns to scale (CRS)*



Following the mathematical notations in (Sherman & Zhu, 2006), given that for DMU_j, representing any country under evaluation, $\mathbf{x}_{ij}$ $\{i= 1, 2, 3..., m\}$ is the amount of inputs used, the outputs denoted by $\mathbf{y}_{rj}$ $\{r= 1, 2, 3.....s\}$ and that $\mathbf{u}_r$ and $\mathbf{v}_i$ represent weights automatically assigned by the DEA program to output r and input i respectively, the mathematical formulation for θ = efficiency is denoted as:

$$\text{Maximize } \theta = \frac{\mathbf{U1Y1}o + \mathbf{U2Y2}o + \ldots + \mathbf{U}r\mathbf{Y}ro}{\mathbf{V1X1}o + \mathbf{V2X2}o + \ldots + \mathbf{V}m\mathbf{X}mo} = \frac{\sum_{r=1}^{s} \mathbf{U}r\mathbf{Y}ro}{\sum_{i=1}^{m} \mathbf{V}i\mathbf{X}io}$$

$$\text{Subject to: } \frac{\sum_{r=1}^{s} \mathbf{U}r\mathbf{Y}rj}{\sum_{i=1}^{m} \mathbf{V}i\mathbf{X}ij} \leq 1 \qquad j = 1, 2 \ldots n$$

$$\mathbf{U}r, \mathbf{V}i \geq 0 \qquad (1)$$

For the input oriented (2) CCR model, is obtained by holding $(\sum_{i=1}^{m} \mathbf{V}i\mathbf{X}io)$ equal to 1 thus:

$$\text{Max } \theta_j \quad \sum_{r=1}^{s} \mathbf{U}r\mathbf{Y}ro$$

$$\text{Subject to:} \quad \frac{\sum_{r=1}^{s} \mathbf{U}r\mathbf{Y}rj}{\sum_{i=1}^{m} \mathbf{V}i\mathbf{X}ij} \leq 1 \qquad j = 1, 2 \dots n$$

$$\left(\sum_{i=1}^{m} \mathbf{V}i\mathbf{X}io\right) = 1 \tag{2}$$

$$\mathbf{U}r, \mathbf{V}i \geq 0 \quad i = 1,2 \dots, m \; ; \; r = 1,2 \dots, s$$

Output oriented CCR model follows the restrictions in (3) below:

$$\text{Min } \theta_j \quad \sum_{i=1}^{m} \mathbf{V}i\mathbf{X}io$$

$$\text{Subject to: } -\left(\sum_{r=1}^{s} \mathbf{U}r\mathbf{Y}rj\right) + \sum_{i=1}^{m} \mathbf{V}i\mathbf{X}ij \geq 0 \qquad j = 1, 2 \dots n$$

$$\sum_{r=1}^{s} \mathbf{U}r\mathbf{Y}ro = 1 \tag{3}$$

$$\mathbf{U}r, \mathbf{V}i \geq 0 \quad i = 1,2 \dots, m \; ; \; r = 1,2 \dots, s$$

Restrictions that are introduced to the model are to ensure non-negative efficiencies. In addition the efficiencies generated in the above DEA formulae should be within the interval $[0; 1]$ such that $\theta = 1$ represents the best practice DMU that lies on the frontier and for,$0 \leq \theta < 1$, the DMU is considered relatively inefficient and will be below the frontier in an input oriented model and above the frontier in an output oriented model. As mentioned earlier the CCR models however assume the proportionality of inputs to outputs which is not the case in our benchmarking study hence the need to adopt the Banker-Charnes-Copper (BCC) model. It proposes a solution for analyzing DMUs whose inputs and outputs do not have a CRS relationship by introducing new restriction that permits variable returns to scale to the original CCR model (Martic, Novakovic, & Baggia, 2009).

Figure 3.2. *Illustration of variable returns to scale (VRS)*

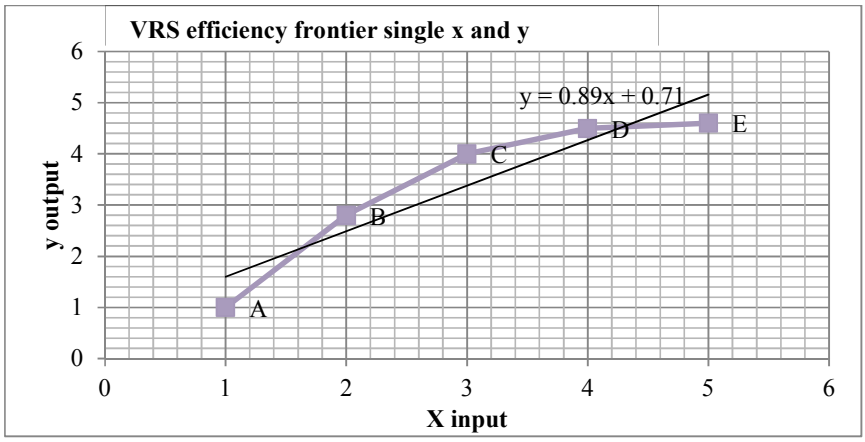


Figure 3.2 represents variable returns to scale VRS as proposed in (Cooper, Seiford, & Tone, 2007) (Zhu, 2014).The curve A-E representing the best practice frontier has points AB that shows increasing returns to scale, B constant returns to scale and BC, CD, DE representing decreasing returns to scale.

Following notation by (Zhu, 2014) the BCC Model input oriented model is denoted by:

$$\text{Min } \boldsymbol{\theta}$$

$$\text{subject to: } \sum_{j=1}^{n} \boldsymbol{\lambda} j \mathbf{X} ij \leq \theta \boldsymbol{X} io \qquad i = 1,2 \dots, m,$$

$$\sum_{j=1}^{n} \boldsymbol{\lambda} j \mathbf{Y} rj \geq \mathbf{Y} ro \qquad r = 1,2 \dots, s,$$

$$\sum_{i=1}^{n} \boldsymbol{\lambda} j = 1 \qquad \boldsymbol{\lambda} j \geq 0 \qquad j = 1,2 \dots, n, \qquad (4)$$

Where DMU_o is one of the n units under evaluation, λ is the weighting and the rest of the parameters are as in the CCR model above. The models in (4) and (5) are in the BCC basic form before calculation of slacks. The output oriented model will be thus:

Max $\boldsymbol{\Phi}$

$$\text{subject to: } \sum_{j=1}^{n} \boldsymbol{\lambda} j \mathbf{X} ij \leq \boldsymbol{X} io \qquad i = 1,2 \ldots, m,$$

$$\sum_{j=1}^{n} \boldsymbol{\lambda} j \mathbf{Y} rj \geq \Phi \mathbf{Y} ro \qquad r = 1,2 \ldots, s,$$

$$\sum_{i=1}^{n} \boldsymbol{\lambda} j = 1 \quad \boldsymbol{\lambda} j \geq 0 \qquad j = 1,2 \ldots, n, \qquad (5)$$

The mathematical presentations (1)-(5) present the basic linear programming behind the model used in this study. However since the main restriction in the primal model requires that generated efficiencies be less or equal to 1, the problem of finding too many DMUs on the frontier is very high. To further discriminate on the BCC relatively efficient DMUs forming the best practice frontier, the study employs the super-efficiency BCC model variant first proposed by Andersen and Petersen (Cooper, Seiford, & Tone, 2007, pp. 309-321). Super-efficiency models allow the flexibility of the upper limit of efficiency which in the earlier models could not exceed 1. The Super-BCC-I and Super BCC-O which are input oriented and output oriented respectively are used. The former is an input oriented super efficiency model and the latter is the output oriented model as required by the approach to the study. In the case where the two models run smoothly without other DMUs retaining infeasible linear programing (LP) strings, the results obtained can be conclude as representative of the DMUs' efficiencies. However when the opposite happens in either of the models such that some DMUs retain the score of 1 as their efficiency due to infeasible LPs then the use of an additional model was suggested by (Cooper, Seiford, & Tone, 2007, pp. 315-319) as a way of curbing this problem. The super efficiency model which they strongly suggested to be always feasible was the Super SBM-V which basically represents super efficiency calculated using variable returns to scale and utilizing slacks on DMU variables to produce the final efficiency score.

3.3. DEA Software and Generated Outcomes

Complexities arising from incorporating multiple inputs and outputs in a benchmarking problem have led to the development of numerous data envelopment software. However Microsoft Excel based DEAFrontier programs developed in

conjunction with the one of the major contributors to the subject Professor Joe Zhu have proved indispensible as well as affordable (Sherman & Zhu, 2006, pp. 70-89). The Excel based DEA Solver Learning version 8.0 running as a macros instruction was used for this study. The software allows for selection of the model to be used then specification of data workbooks that should contain a specific arrangement of the data. Each data workbook contains the 13 DMUs under evaluation in the first column then followed by input then output data columns. Thereafter, we define the target output file to which the generated outcomes will be saved and we run the program. This procedure was repeated for each year from 2005-2012.

The output workbook generated by the solver contains first a duplicate of data initially provided for easy reference. A summary worksheet is also provided. This contains details of the model employed, a summary statistics of inputs and outputs and the number of inefficient and efficient DMUs, as well as the latters' frequency in reference sets[6]. It also provides a variables correlation table for inputs and outputs and the average scores of efficiencies. A separate scores worksheet is also created which shows the score efficiencies for each DMU and its corresponding rank as well as its closest reference units. The worksheet 'slack' provides results on sources of inefficiency which means it indicates areas necessitating improvement for relatively inefficient units by pointing out excess inputs requiring cutting down as well as output shortages. Other worksheets generated by solver but which are only partially analyzed in this study are 'projection', 'weighted data' and weight. Figure 3.3 shows the generated worksheets for each year's workbook. The detailed workbook sample is found in appendix II.

Figure 3.3. *DEA solver generated excel workbooks*

3.4. Advantages and Limitations of DEA Analysis

The main advantage of data envelopment analysis is its ability to auto-generate weights from observed data which reduces the possibility of subjectivity in country

[6] Reference sets are described in the overview of Chapter 3 of this paper.

analysis. From this point of view the method is unchallengeably superior to most multicriteria decision making tools (MCDAs). Furthermore while other MCDA models such as UTA and UTANDIS (Kosmidou, Doumpos, & Zopounidis, 2008) have gained popularity in their classification accuracy of countries they stand relatively dependent on CRAs ratings. This can be evidenced by the need existing to have a reference set from these agencies if these models are to be used. For already skeptical countries this provides a defense against the use of such models on grounds of 'black box effect'[7]. As with the leading this has been a pertinent question either on the average rating, weights allocation or qualitative variables measurement. In DEA however the 'Black box effect' is reduced considerably through the existence of a firm mathematical linear programing framework that supports the treatment of the selected variables. To aid to this, this study furthermore avoids the use of qualitative variables that may be considered subjective in measure.

(Cooper, Seiford, & Tone, 2007) Put forward an argument on the superiority of DEA over some regression analysis based models. Unlike DEA which seeks the maximum possible performance for benchmarking, regression generated best fit curve tend to not representing the best practice units. Using figure 3.2 to demonstrate the idea, DMUs A-E which are all DEA efficient though at different levels of the VRS scale will be best represented by the linear equation ($y = 0.89x + 0.71$) which however makes DMUs A and E seem under par compared to the rest. However the authors go on further to explain that rather than using DEA as a rival model to regression analysis the two models can be co-applied to achieve even better results.

While the merits were enough to warranty its selection for this study, DEA poses a major drawback in its inability in certain cases to distinguish between efficient units. Resulting from according the benefit of doubt to each DMU in order to make each of them as efficient as possible as explained in (Sherman & Zhu, 2006), the resulting many efficient units may lead to late decision making or even indecision. Despite possibility of such outcomes the underlying intention is instrumental in that no efficient DMU can be classified as inefficient. Like other mathematical models, DEA too requires complete data for it to produce meaningful results since weights are calculated from observed

[7] 'Black box effect' is an expression depicting the mysterious generation of information with no clearly traceable or disclosed methodology which makes it difficult to not question the legitimacy of the given results.

data and this may necessitate the exclusion of some important variables or limit the number of years that can be possibly studied.

3.5. Study Variables and Data Sources

From the vast literature which has been developed over the years on the subject of country risk and FDI, we take into consideration the ones which have been consistently used for similar purposes as well as introduce some new proxy variables that aim to reduce subjectivity that is associated with non-quantifiable variables.

3.5.1. Variables relating to government debt

To boost the confidence of the investors and assure them of a stable macroeconomic environment, governments need to demonstrate their capabilities to discharge their fiscal duties without menacing the private sectors either through abrupt policy changes or arising social unrest. (Kosmidou, Doumpos, & Zopounidis, 2008), mentioned 3 articles that used debt servicing ratio and another 3 which used domestic credit to GDP ratio as a measure of a country's ability to fulfill its future obligations. Cases like Japan and USA however make the application of this measure as a global yardstick less accurate since they have huge amounts of debt/GDP (Trading Economics, 2017) yet still their investment attractiveness remains high. On the other hand (Haque, Kumar, Mark, & Mathieson, 1996)iterated the importance of economic indicators such as debt servicing in determining country risk for developing countries. In this aspect, this study includes government debt to GDP ratio as a measure of debt duress a government is exposed to. This means the higher the ratio the less favorable a country is to be considered thus this variable is taken as an input in our model because the lower the ratio the better.

Besides demonstrating creditworthiness on long term debts that a government may owe, researchers have emphasized the necessity of having reserves to cover unexpected balance of payment and fiscal deficits. For (Ribeiro, 2001) when agents lose their confidence in a country, unexpected speculation on its currency may cause imbalances in the external sector. Furthermore excess imports than expected or less than expected exports result in higher demand for foreign currency on short term basis. It is

under such circumstances that a country needs liquid reserves to avoid debt payment crises which may have long-lived adverse effects on investors' confidence. Total reserves in months of imports is a well-used measure in analyzing sovereign credit risk and as such it is used in this study as it represents the preparedness of a government to take care of its debt thus not increasing pressure on the private investors through taxes and other policy changes such as unreasonable import barriers. The higher the amount of reserves the better the country hence in our analysis the variable, total reserves in months of imports, is an output variable.

3.5.2. Taxation

Once used as a tool to encourage growth for local infant industries and discourage foreign firms from entering local markets, taxation policies have been inverted in most countries as a way to attract FDI. According to (Nunnenkamp, 2002) trade openness; under which taxation policies can be categorized, do not necessarily induce FDI inflows rather they are a prerequisite for any country that's looking to improve inflows. Since this study has a comparison objective of specific countries the levels of taxation is taken into account. The variable total tax rate as a percentage of commercial profits) is included in this paper as one of the discrimination categories that investors may use when they are faced with multiple possibilities. The total tax on profit is calculated by the World Bank as the total amount of taxes payable by a business after taking into account deductions and exemptions. As higher taxes on profits will ultimately result in lower profits, low tax alternatives are considered as favorable hence the variable is an input which needs minimization.

3.5.3. Inflation

In his research (Gichamo, 2012) confirmed the existence of a negative significant correlation between FDI inflows and inflation rates for a sample of 14 Sub-Saharan Africa. Supporting this idea are also most researchers as evidenced by (Kosmidou, Doumpos, & Zopounidis, 2008), who state inflation as the most used variable in country risk analysis. When a country has high inflation rates the purchasing power of the market falls drastically while production cost rise sharply thus making it less lucrative for a business to operate in such an environment, as can be evidenced by the hyper-

inflation experienced in Zimbabwe through the five years leading up to 2008. The effects of such situations are more detrimental for FDI projects where divestment can be a long process because of the illiquidity of the assets. In this study inflation rate calculated using the consumer price index was incorporated and since the higher the inflation the less attractive a country becomes for investment, we consider it as an input seeking minimization.

3.5.4. Security of invested property

Host countries have the mandate to ensure that a stable environment is provided for any business expansions to take place. Just as many other regions Southern Africa endured destructive wars of liberation as well as violent demonstrations but these were prevalent before 1990 and the ending of apartheid in 1994 marked a new era of macro-political stability in the region as a whole. Recent decades have seen major destruction due to terror attacks which have become rampant globally. However as (Marongwe, 2015, pp. 776-793)correctly stated, the study region has been somehow spared from international terrorism. The author showed also the importance of taking measures to ensure that the some grassroots problems that may give birth to such instability are addressed quickly by SADC. In isolated cases however threats to macro-political stability have arisen in certain countries, for example xenophobic attacks in South Africa, such undesirable events are worrisome for international investors. The measurability of such threats has been but problematic for most researchers and has been the most subjective of country risk analysis. To maintain minimal subjectivity this study includes the number of reported cases of property destructions due to demonstrations or terror attacks over the years as a measure of threat to invested infrastructure which is a concern for FDIs. As high threats are disadvantageous for a country this variable is an input in this paper.

3.5.5. Gross domestic product (GDP)

Most studies on sovereign risk and credit risk widely acknowledge GDP as a major determinant of a country's performance since it measures a country's total local economic production against its local consumption. GDP per capita has however been more favored as a comparison yardstick rather than the total GDP value. As explained

in (Ribeiro, 2001) (Kosmidou, Doumpos, & Zopounidis, 2008) (Hayakawa, Kimura, & Lee, 2011) GDP per capita is so far the most accurate economical measure of the country's productivity since it helps explain a country's growth rate efficiency in the long run. A high GDP has in most articles been associated with high levels of income that means a greater demand for goods and services. Supporting these views is the article on FDI inflows in Sub-Saharan African countries by (Gichamo, 2012) in which a positive significant correlation with FDI inflows was established. The paper used the measure as a proxy variable for market size which is in line with the other authors' demand perspective. However some critics argue that very high GDP per capita may deter increase in FDI inflows for efficiency seeking firms since it will result in increased labor costs (Hayakawa, Kimura, & Lee, 2011). This research includes this variable as a market measure as well as an indicator of efficiency in productivity. Countries with higher GDP per capita are considered more attractive hence an output to be maximized.

3.5.6. Foreign direct investment (FDI) stocks

Elaborating the importance of FDI stocks in the attraction of more FDI (Hayakawa, Kimura, & Lee, 2011) emphasized that larger FDI stocks are regarded as a signal of a benign business climate for investors thus higher clustering effects in such host countries. While FDI stocks are the most utilized measure in similar past researches, this study considers FDI stock per capita as a proxy measure of investor level of confidence per capita. In other words explaining how much of foreign investment each host country resident is entrusted with. This adjustment is necessary in our comparison since there are is need to take consideration of country size when measuring individual efficiencies. For example comparing countries such as DRC and Turkey's total FDI stocks to smaller counterparts' such as Mauritius becomes rather absurd. The higher the FDI per capita the more favorable a country is for investors as such it becomes an output that all possible host nations should increase.

3.5.7. Precluded variables and a summary of included variables

Besides the above explained variables which have been considered in this research, other variables such as exchange rates, unemployment and interest rates have been considered very useful in explaining FDI inflows by other researchers but the lack

of consistency in definition, calculation and policy implementation regarding these factors makes their inclusion for comparison less accurate. Variables such as exports average annual growth rate, imports growth rate, current account balance and external debt as a percentage of GDP have been excluded from the study since they are closely related and well represented by already included variables. In addition to these variables, all other measures which have received constant criticism because of their purported subjectivity have been excluded from the analysis.

As summarized in table 3.1 the variables that were incorporated in this study had their data collected from credible secondary databases. The use of secondary data was considered the best option given the nature of this study is macroeconomic in nature and the number of countries involved would make the use of primary data infeasible. The World Bank group was the main source of economic indicators' data and its integrity is generally accepted in academic research works. The United Nations Conference on Trade and Development (UNTCAD) which is directly involved in efforts to encourage and improve global trade relations compiles data on the flows of trade making it the best source for data for FDI flows. Knoema and Vision for Humanity were sources for GD/GDP and TTP respectively and the data was obtained ethically from these databases.

Table 3.1. *Incorporated Variables Summary*

	Variable	**Orientation**	**Data Source**
FDIS/C	Foreign Direct Investment stocks per capita (current $)	Output	UNCTAD Database 2017
GDP/C	Gross Domestic Product per capita (current international $ 2017)	Output	World Development Indicators (2017)
TRMI	Total reserves in months of import	Output	World Development Indicators (2017)
INF	Inflation rate (Consumer Price Index)	Input	World Development Indicators (2017)
GD/GDP	Government Debt to GDP ratio	Input	Knoema Database (2017)
TTP	Threat to property	Input	Vision for humanity.com (2017)
TTRC	Total tax rate (% of commercial profits)	Input	World Development Indicators (2017)

4. DATA PRESENTATION AND ANALYSIS

With the objective of broadening the comprehension of the economic footing of the different DMUs incorporated in this study this chapter presents the trends of the given DMUs' study variables during the period of analysis(2005- 2012). We combine the data presentation with descriptive statistics analysis of the variables and DMUs for the different years and this will be complemented by the later presentation and analysis of the results obtained through running DEA models presented in chapter 3.

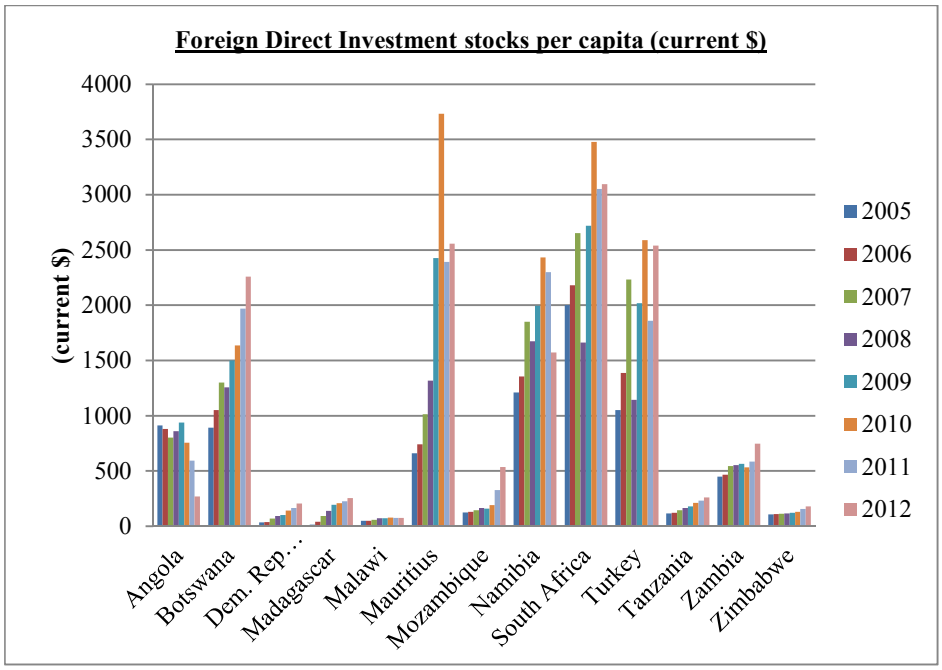
4.1. Data and Trends Presentation

In this section we analyze the changes in levels of inputs and outputs from a comparison perspective for all DMUs. Through this we can easily detect the extent and direction of the variable trend thus building a general picture of the most possible policies in place in the country. We look at the FDI stocks per capita trend, GDP per capita trends, total reserves in months of import, total tax rate as a percentage of commercial profits, inflation, government debt to GDP evolution and threat to invested property.

4.1.1. Foreign Direct Investment stocks per capita trends

As has been iterated in the previous chapters, a country's FDI stock can show its favorability as an FDI destination. Using the FDI stock per capita measure shows the distribution of the stocks over that country's population thus creating a more equal platform for meaningful comparison with other countries. The figure 4.1 shows the trends of FDISC, at current $US (2017), of the 13 DMUs under study over a period of 2005 to 2012.

Figure 4.1. *Foreign Direct Investment stocks per capita. Data source UNCTAD Database 2017*



The conspicuous lines representing stocks in Mauritius 2010 and South Africa 2010, which are respectively the highest and second highest values recorded among all the DMUs for the given period immediately draw attention to the 2 countries' trends. We see that Mauritius experienced a dramatic 500% rise in FDI stocks growth from 2006-2010. This exceptional upward trend is well amplified by (Zafar, 2011, pp. 26-28) in which is explained the country's creation of a conducive FDI environment through no capital controls, fixed low corporate tax and a stable currency among other factors. This according to the author contributed to Mauritius being rated the best FDI destination in Africa and 17th most favorable investment country in the world in 2010 by World Bank. However as shown below in Table 4.1 the highest average FDISC for the period of study was recorded for South Africa which showed consistently high comparative stocks than most countries with the exception of the year 2008.

Table 4.1. *Mean, minimum, maximum and standard deviations of FDISC (current $)*

	Mean	Minimum	Maximum	Standard Deviation
Angola	752.13	270.69	940.0397	223.02
Botswana	1483	892.736	2260.023	460.38
Dem. Rep Congo	105.5	35.1949	204.3952	60.239
Madagascar	145.66	13.6847	253.4412	89.373
Malawi	65.839	48.1955	77.84855	12.03
Mauritius	1855.1	658.544	3732.799	1089.2
Mozambique	221.63	125.846	535.9952	142.33
Namibia	1798.6	1210.36	2431.506	431.33
South Africa	2605	1661.39	3478.482	615.76
Turkey	1852.2	1051.01	2588.161	603.54
Tanzania	178.05	113.624	261.9121	53.669
Zambia	555.13	449.119	747.1321	90.733
Zimbabwe	128.06	106.516	178.5694	25.64

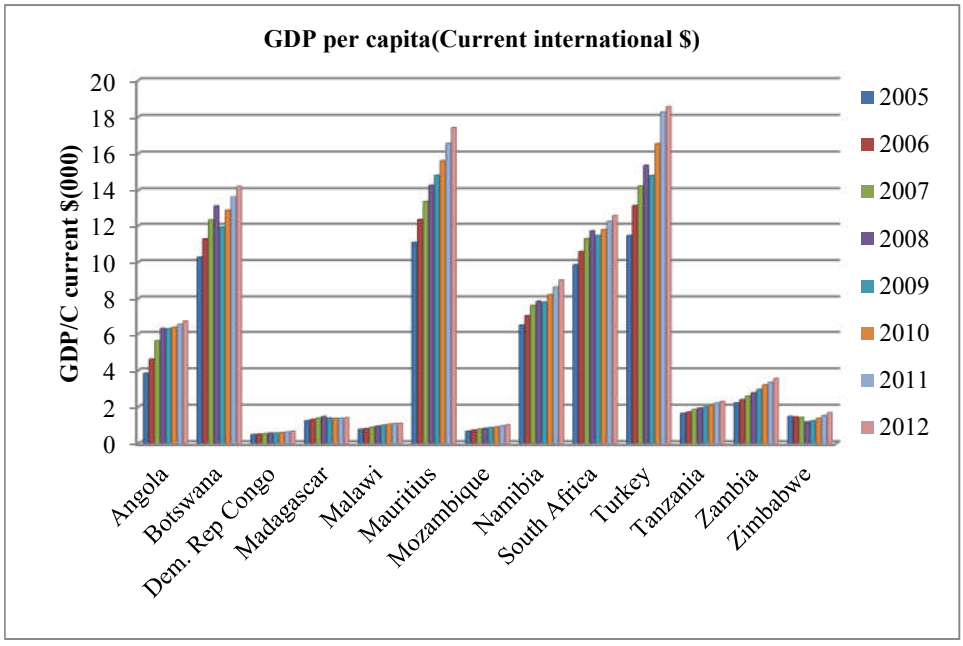
Mauritius, Turkey, Namibia and Botswana then follow in that order after South Africa with averages above $1400 which shows the existence of a favorable FDI promoting climate. The remainder of the countries logged worrisomely low comparative stocks with their maximum values over the period failing to exceed $1000. Malawi recorded the lowest maximum and average values of all the countries and The Democratic Republic of Congo and Madagascar registered the lowest minimum values for the years. Important to note is the very high standard deviation recorded by Mauritius which indicates in their case an aggressive set of positive FDI policies. Most of the countries with the lowest FDISC values like Malawi and Zimbabwe also showed very low standard deviations over the period which most likely shows indifference of FDI policies in place. While most of the countries show either a relatively flat or a steadily rising trend, Angola is the only country showing a rather serious declining trend especially in the last 4 years which is an indication of an upset in the foreign investment climate.

4.1.2. Gross Domestic Product per Capita trends

Since our approach to GDP per capita in this study is from market size measure and productivity efficiency perspective we consider the countries with the highest values as the most favorable FDI destinations. The DMUs which show important growth rates of GDP/C over the period present the growth of disposable income which may translate into high demand for products thus are in this context the most favorable potential markets.

In figure 4.2 we can see that Turkey, Mauritius, Botswana and South Africa have the highest GPD/C values averaging over $10000 in that order. As the descriptive statistics table below too will show, Turkey stands with the highest average of nearly $15300 which is over twenty seven times higher than the per capita GDP of the Democratic Republic of Congo (DRC) which is the lowest of all the DMUs at almost $560. Mozambique, Malawi, Madagascar, Zimbabwe and Tanzania also join the bottom ranks with average values of less than $2000.

Figure 4.2. *GDP per capita in current international $(2017) Data source: World Development Indicators (2017)*



While most of the countries experienced a rising trend in their GDP/C the latest mentioned set of countries experienced chronically low percentage changes which is an indication of serious stagnation of their economies. On the other hand Turkey and Mauritius experienced the highest positive changes from 2005 to 2012 thereby making them standout as the best potential markets as the disposable income will consequently high. Botswana, South Africa and Namibia look relatively equally competitive as markets in this perspective. Taking into consideration the argument that high GDP/C can drive away FDI because of the high wages that are associated with it in most scenarios; we can see that countries like Angola Namibia and emergently Zambia may be good options for labor intensive FDI ventures.

Table 4.2. *GDP/C mean, minimum, maximum and standard deviation*

	Mean	**Minimum**	**Maximum**	**Standard Deviation**
Angola	5786.498	3838.265	6758.278	1036.979
Botswana	12446.48	10268.51	14210.962	1280.916
Dem. Rep Congo	559.0609	476.7372	652.38859	58.26939
Madagascar	1363.716	1240.335	1468.2103	67.23751
Malawi	946.824	765.2237	1085.679	122.9429
Mauritius	14426.74	11078.03	17408.189	2132.427
Mozambique	834.5517	654.6779	1010.2213	118.4184
Namibia	7833.041	6480.58	9021.9129	816.1494
South Africa	11435.1	9847.833	12556.748	877.5368
Turkey	15289.46	11457.99	18560.178	2448.574
Tanzania	1958.715	1634.893	2289.2619	227.6572
Zambia	2874.743	2212.044	3553.1158	471.4089
Zimbabwe	1412.506	1170.462	1679.1256	161.7566

4.1.3. Total reserves in months of imports

As major constraints on government budget are subsequently transferred to the private sector mainly in form of increased corporate taxes as explained in Chapter 3, it is paramount that governments especially in developing countries should build reserves to counterbalance unexpected short term budget deficits which may become chronic if

unchecked. One of the measures of this ability is total reserves in months on imports which means the higher the number of months the more capable is the government to meet its short term obligations with less pressure thus a more predictable environment in terms of corporate tax levels.

Table 4.3. *Total reserves in months of imports; mean, minimum, maximum and standard deviation*

	Mean	Minimum	Maximum	Standard Deviation
Angola	4.562986	1.997942	7.094723	1.67992
Botswana	15.44542	10.15358	20.57146	3.775377
Dem. Rep Congo	0.880313	0.105249	1.641053	0.620656
Madagascar	2.911362	2.388033	3.394886	0.354194
Malawi	1.234495	0.798479	1.68516	0.306381
Mauritius	3.692571	2.761873	5.039511	0.712876
Mozambique	4.059903	2.818776	5.343125	0.847043
Namibia	2.729003	1.228952	4.563721	1.010082
South Africa	3.920412	3.161144	5.111812	0.725207
Turkey	4.761601	3.889625	5.487161	0.583864
Tanzania	4.569125	3.475476	5.297549	0.799004
Zambia	2.98319	1.928369	5.035091	1.120886
Zimbabwe	0.661673	0	2.334669	0.849031

With reference to table 4.3, the summary statistics of the study DMUs' reserves in months of imports, we can conclude that Botswana is undisputedly and by a wide margin the most favorable country in terms of possibility of tax policy changes. With an average reserve cover of almost 15.5 months of import it gives the government ample time to address short-term imbalances with the highest flexibility. On the other extreme Zimbabwe has the lowest average reserve in months of imports approximating 0,66 and minimum of no reserves at all which represents the most volatile state which can trigger abrupt unsuitable fiscal policy changes when perpetually recorded for many years . The DRC and Malawi also had minimums of less than a month of reserves which strain the government's budget and the average reserves, over the period of 2005-2012, of less than two month import cover also spell the possibility of an unstable tax policy environment. Other than the above mentioned DMUs, the remaining ones registered

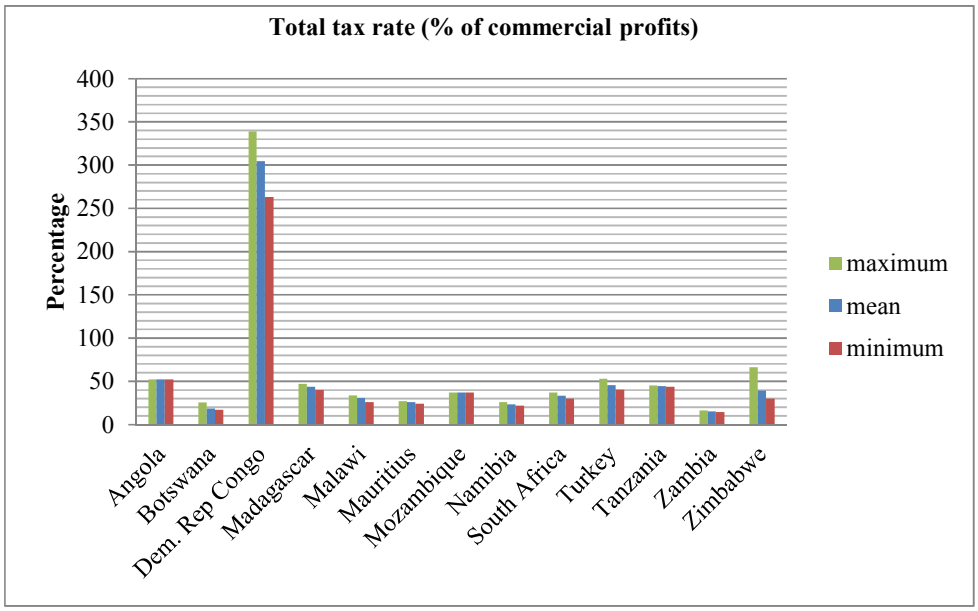
maximums of at least above 3 months cover which shows the countries' tendency to increase their reserves whenever their budgets permit.

4.1.4. Total tax rate as percentage of commercial profits

For both local and foreign investors taxation policies are paramount to their business decisions. It is therefore a logical deduction that countries with more stable relatively low tax rates on commercial profits should be considered more favorable for FDI. As we iterated in the previous section, measures like vast reserves accompanied with a robust fiscal policy can permit a government to create an aura of predictability in its taxation policies and permit for their swift adjustment without upsetting the investors' confidence. Equally, when a government has little resources to cover its short term obligations it may increase tax or introduce a new tax law that may deter FDI inflows.

The chart below shows the average rates for the study DMUs and also shows the minimum and maximum values recorded over the period of study so as to determine the range of the rates over the same period. In this regard the DRC stands out with shockingly heavy taxation. The average of above 300 percent total tax is incomparably the highest among all the countries under study. According to the World Bank Metadata 2017 the country has the highest ever recorded total tax on commercial profit which once stood at 339.7 percent. However after 2012, this rate nosedived to around 50 percent (World Bank, 2017). The second highest maximum recorded was in Zimbabwe at 66.3% and there after Turkey and Angola follow in that order with maximums above 50%.

Figure 4.3. *Mean, minimum and maximum total tax rate on commercial profits.*



The most favorable countries with regards to this variable were Zambia and Botswana which had averages of approximately 15 and 18.7 percent respectively. Zambia also recorded the lowest minimum and maximum at 14.3 and 16.2 percent respectively. The two next favorable countries were Namibia and Mauritius logging averages below 30 percent. After analyzing the two extremes the remaining DMUs showed means between 30-50 percent but with relatively small range values which shows consistency over the period.

4.1.5. Inflation

Consumer price index (CPI) based inflation rates were used. These rates are very important for all investors but more so to foreign investors than the locals because repatriation of their profits involves exchange rate conversions which will definitely affect their profits value the longer they wait. Therefore the obvious logic is that given a level playing field FDI inflows should be more in countries with low and stable inflation rates while capital flight has to be expected in countries implementing inflationary policies.

Looking at table 4.4, we can see that Zimbabwe experienced serious inflation in comparison to other DMUs from 2005-2008. According to this World Bank data in

2007 the highest yearly inflation rate was recorded at 24411 percent but other sources argue that it was even higher than this. Clearly this shows that the country was going through serious structural policy implementation problems. This is supported by the fact that the approval by the Ministry of Finance of the country to have a multi-currency system with effect from 1 January 2009 (Reserve Bank of Zimbabwe, 2009) saw the inflation rate drop down to just around 3 percent and remaining below 4 percent for the remaining years.

Overlooking the Zimbabwean situation, other countries which had relatively high inflation compared to other DMUs were Angola at 22.96 and the DRC at 21.32 percent all in 2005 while in 2012 Malawi registered 21.27 percent. Namibia and Mauritius are the DMUs showing the most stable inflation environment over the period with rates fluctuating below 10 percent. Excluding the 2008 rate, South Africa also enters in the same set of countries which showed stability of the variable. The remaining countries reported oscillating rates with Angola, Zambia and Madagascar showing an overall gradually decreasing trend. Tanzania was the only country which experienced a year on year rise of inflation with the exception of the year 2010.

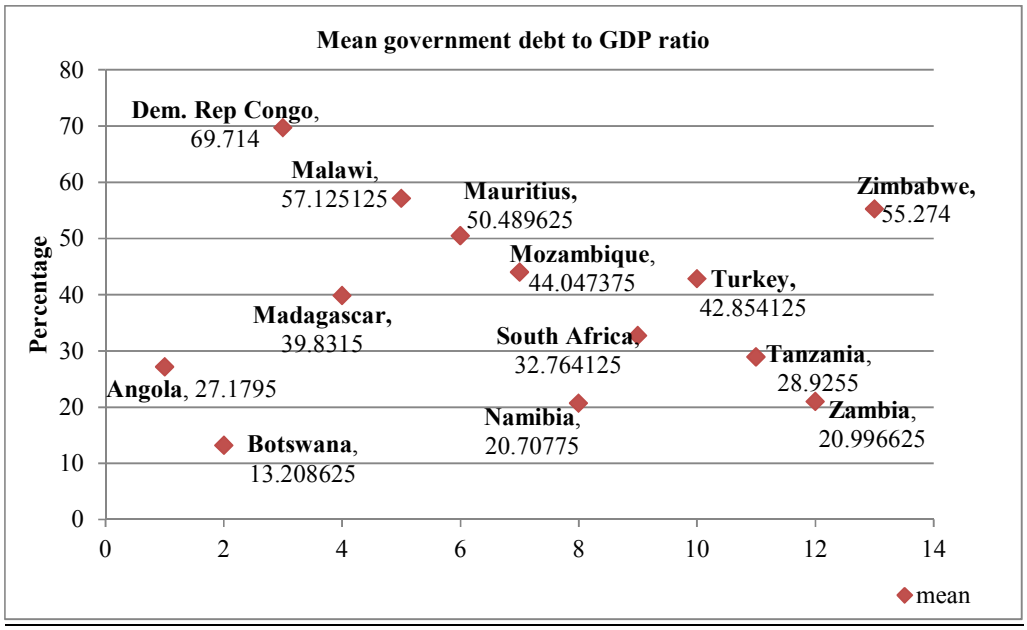
Table 4.4. *Inflation data for DMUs 2005-2012 Data source World Bank*

	Inflation(CPI)							
DMU/Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Angola	22.96	13.30	12.25	12.47	13.73	14.47	13.47	10.29
Botswana	8.61	11.56	7.08	12.70	8.03	6.95	8.46	7.54
Dem. Rep Congo	21.32	13.05	16.95	17.30	2.80	7.10	15.32	9.72
Madagascar	18.51	10.77	10.30	9.22	8.96	9.25	9.48	6.36
Malawi	15.41	13.97	7.95	8.71	8.42	7.41	7.62	21.27
Mauritius	4.94	8.93	8.80	9.73	2.55	2.89	6.53	3.85
Mozambique	7.17	13.24	8.16	10.33	3.25	12.70	10.35	2.68
Namibia	2.28	4.96	6.55	9.09	9.45	4.87	5.01	6.72
South Africa	3.40	4.64	7.10	11.54	7.13	4.26	5.00	5.65
Turkey	10.14	9.60	8.76	10.44	6.25	8.57	6.47	8.89
Tanzania	5.03	7.25	7.03	10.28	12.14	6.20	12.69	16.00
Zambia	18.32	9.02	10.66	12.45	13.40	8.50	6.43	6.58
Zimbabwe	302.12	1096.68	24411	1600	1000	3.03	3.28	3.92

4.1.6. Government debt to GDP ratio

The ability to fulfill debt obligations both in the short and long term is essential for boosting investor confidence in the country as prior explained under the levels of reserves a country possesses. With the GDP representing a country's levels of production which increase its revenue thus its ability to pay debts, countries with lower government debt to GDP ratios represent the ideal investment environments as the private investors can expect less fiscal policy changes which usually are associated with tax increases as the government tries to increase its income. Environments with consistently high ratios are hence considered as generally prone to more serious structural economic challenges such as poor public service delivery, infrastructure, low production capacity utilization and unemployment as the debts and interest on debts deplete the government's income. Even for countries that service their debts on time and have robust economic policies, unexpected force majeure events such as poor rains for an agriculture based economy will result in low yearly GDP thus increase debt pressure on the succeeding years. In figure 4.4 we present the average ratios of countries' government debt to GDP over the period of study.

Figure 4.4. *Mean government debt to GPD ratio*



The DRC came through with the highest average ratio of government debt to GDP which was at 69.71 percent and as we have analyzed in previous sections on GDP, it is also among the countries with one of the lowest GDP per capita which means it has higher probability of defaulting on its debts and as the production is low the only other way of raising government revenue is by taxing companies and this has also been verified in the case of this DMU. The same rationale is applicable for Malawi, Zimbabwe and Mozambique who had the second, third and fifth highest average ratios respectively. Mauritius and Turkey follow in with comparatively high ratios. However, the two countries seem to have adopted aggressive economic growth policies as we have seen previously that they have the highest GDP/C compared to the other countries. Furthermore Mauritius has one of the lowest total taxes on commercial profit which shows that the government had other policy measures in place to service its debts without exerting tax pressure on companies. Turkey on the other hand had relatively high taxation policies which are debatable whether they were to raise revenue or a strategic barrier to discourage foreign companies from entering the market thus promoting its own industry.

Botswana is the country which had the lowest average ratio yet with the third highest GDP/C, relatively very low taxes on profits and the largest reserves. This DMU thus shows the least possibility of defaulting on its debts as it has more resources from which to service them efficiently. Namibia and Zambia are the next favorable possible FDI destinations with low debt to GDP ratio approximately tied at 20 percent. The remaining countries also have relatively close ratios forming the rather indifferent set of countries since they are at neither of the extremes.

4.1.7. Threat to invested property

As iterated in Chapter 3 measuring the security of a country is one of the most debatable and subjective aspect of country risk rating. We used the number of reported cases of property destruction due to terror attacks or demonstration as a proxy to invested property security. While some scholars may argue that such threat can be covered by insuring the property, this volume argues that the risk premiums involved still vary accordingly.

According to the data obtained from Vision for Humanity official website countries which had the highest number of cases of attacks on property are the DRC at 183 in 2009 and Turkey at 172 in 2012. Throughout the period Turkey had the highest number of such cases with the exception of the year 2009. The DRC also recorded cases every year with a low of 6 cases recorded and also the highest number among all the DMUs. Zimbabwe, South Africa, Madagascar and Angola recorded some attacks on properties in two years or less but with the total number of cases recorded not exceeding ten over the period 2005-2012. The remaining countries did not record any attack on property over the years of study which automatically makes them equally more attractive in for investment in this aspect because of the low insurance premiums that should accrue to such an environment.

4.2. Presentation and Analysis of Results

The data form the various inputs and outputs as presented in the previous section was arranged and run in DEA Solver Learning version 8.0. And as explained in Chapter 3 the models run were Super BCC-I and Super BCC-O and the results obtained are described in this section in that order. While the models were run for each year of the period of study, analyzing the results on a year on year basis does not bring achieve the intended goal of determining overall attractiveness of the DMUs over the period. After looking at the overall scores from the input and output oriented models we averaged the two as used the scores for final classification of DMUs.

4.2.1. Results on Super BCC-I model

As has been elaborated on in the methodology, this model is an input oriented model which seeks to minimize the set of inputs, without any changes taking place on the set of outputs. In the benchmarking sense, it shows the DMU with the least unfavorable characteristics for similar levels of outputs. In table 4.5 we have the DMUs' scores and rankings for every year form 2000-2012. Complementing it is Table 4.6 which now shows the average scores over the same period and gives the DMUs' overall ranking.

Table 4.5. *Super efficiency BCC-I scores and rankings of DMUs from 2005-2012*

						Super BCC-I model scores and ranks 2005-2012										
		2005		2006		2007		2008		2009		2010		2011		2012
DMU	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Angola	0.345432	12	0.684355	8	0.574268	11	0.843718	11	0.702195	11	0.397831	13	0.603445	12	0.696549	11
Botswana	1	3	1	3	1	3	1	3	1	4	1	3	1	4	1	4
Dem. Rep Congo	0.199423	13	0.355603	13	0.386414	12	0.50389	12	0.910638	8	0.647114	10	0.774011	8	0.816859	10
Madagascar	0.408998	11	0.561518	9	0.636298	10	0.969919	8	0.737056	10	0.53057	11	0.658671	11	0.852544	9
Malawi	0.530117	9	0.556464	10	0.823396	8	1.043839	2	0.752134	9	0.780373	9	0.696829	10	0.499995	13
Mauritius	1	3	1	3	1	3	1	3	1	4	1	3	1	4	1	4
Mozambique	0.617595	8	0.553314	11	0.807773	9	0.899208	10	1.094955	3	0.513492	12	0.575629	13	1.4369	1
Namibia	1.489635	1	1.200051	1	1.082049	2	1	3	1.418984	1	1.675725	1	1.271139	3	1.010592	3
South Africa	1	3	1	3	1	3	1	3	1	4	1	3	1	4	1	4
Turkey	1	3	1	3	1	3	1	3	1	4	1	3	1	4	1	4
Tanzania	0.802535	7	0.784962	7	0.943392	7	0.905885	9	0.699326	12	0.797209	8	0.729753	9	0.649234	12
Zambia	1.110379	2	1.184802	2	1.139989	1	1.139989	1	1.133322	2	1.363623	2	1.354153	2	1.381171	2
Zimbabwe	0.511623	10	0.515739	12	0.3223	13	0.234587	13	0.415508	13	0.953356	7	1.524164	1	0.903717	8
Model Name = DEA-Solver LV(V8)/ (Super-BCC-I) Returns to Scale = Variable																

Table 4.6. *DMUs mean score and overall rank for Super BCC-I model 2005-2012*

DMU	Mean Score	Overall Rank
Angola	0.605974125	12
Botswana	1	3
Dem. Rep Congo	0.574244	13
Madagascar	0.66944675	11
Malawi	0.710393375	9
Mauritius	1	3
Mozambique	0.81235825	7
Namibia	1.268521875	1
South Africa	1	3
Turkey	1	3
Tanzania	0.789037	8
Zambia	1.2259285	2
Zimbabwe	0.67262425	10

From the two tables immediately above we can easily see that Zambia and Namibia were the most consistent countries with efficiency scores mostly above one in comparison to their peer DMUs. Their average scores therefore were also greater than one with Namibia being ranked first ahead of Zambia with average efficiency scores of 1.2685 and 1.2259 respectively. We then deduce that Namibia and Zambia were the most efficient countries in terms combined government debt to GDP ratio, total tax rate, inflation and threats to property, for their relative outputs. In other words even though countries had by far much higher favorable values of GDP per capita, total reserves and FDI stocks per capita, the model argues that if comparable efficiency is used in comparison with the other countries, their output levels should be accompanied by even lower levels of at least one of their inputs for them to be as efficient as Namibia and Zambia.

Botswana, Turkey, Mauritius and South Africa were all tied on number three at a score of one which is the general threshold of efficiency in all DEA models. From this we can conclude that even under the super-efficiency input oriented BCC-I models, these countries were considered to be equally efficient even if they varied in terms of

their inputs and outputs. Of the four countries it is interesting to note that even though Turkey had the highest average in terms of threats to property and a relatively high government debt to GDP ratio it still comes out as an efficient DMU because comparatively it still managed to keep the remaining inputs at the favorable extreme while its outputs were mostly competitively higher than most DMUs.

The remaining DMUs averaged scores below the threshold efficiency mark which is one. From that we draw a general conclusion that these countries have been consistently struggling to control at least one of their inputs in relation with their output and compared to peer DMUs. Even though countries like Zimbabwe, Mozambique and Malawi achieved efficient scores, each once over the period, the averages which are not very close to one show the general lack of consistency over the period. This is mostly true for Zimbabwe which averagely ranked at number eleven behind Tanzania which never achieved an efficient score throughout. In such an environment it is difficult to predict the government's next move and as such investors can be over cautious with investments in these countries. The remaining countries, achieved consistently inefficiency spelling scores which show that they were the least preferable group of countries in the management of the inputs given that outputs remained constant. The DRC was averagely ranked the last which comes not as a surprise considering that in the previous sections it was evident that it had the highest tax rates and the highest government debt to GDP ratio. Angola was twelfth and Madagascar, Zimbabwe, Malawi, Tanzania and Mozambique followed with the latest being the most preferable DMU among the inefficient ones.

4.2.2. Results on Super BCC-O model

The model is output oriented as has been described before and as such it generally seeks to maximize the outputs for the similar level of inputs. In the benchmarking perspective the model seeks to classify as efficient the DMUs which have the most favorable combined outputs given that their inputs cannot be changed. In this case the model establishes the DMUs with the most favorable combination of GDP per capita, reserves and FDI stock per capita assuming that their levels of government debt to GDP ratio, total taxes, threats to property and inflation remain unchanged.

We adopt the same approach as we did with the Super BCC-I model, we ran the DEA program for the years separately and we present the yearly efficiency scores and rankings in table 4.7. For an overall picture of the whole period we averaged the yearly scores and created the overall ranking according to these efficiency scores. Disregarding the infeasibility of linear programming for some DMUs in some of the years, the results provided by the model show that South Africa, Turkey, Mauritius, Botswana, Namibia and Zambia all had yearly super efficiencies equal to or above one which makes them the most favorable group of countries in terms of their outputs when we hold the inputs to the model as being constant. The remaining set of countries all generally show efficiencies below one which makes them the less favorable set.

Table 4.7. *Super BCC-O super efficiency scores and rankings of DMUs from 2005-2012*

						Super BCC-O model scores and ranks 2005-2012										
		2005		**2006**		**2007**		**2008**		**2009**		**2010**		**2011**		**2012**
DMU	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**
Angola	0.477354	8	0.545464	7	0.466674	7	0.588284	9	0.52021	8	0.474463	7	0.568114	8	0.698741	8
Botswana	1	4	1	3	1	4	1	4	1	3	3.605238	1	1	4	1	4
Dem. Rep Congo	4.43E-02	13	4.19E-02	13	4.12E-02	13	5.59E-02	13	0.292642	10	0.101618	13	0.102972	12	0.159792	12
Madagascar	0.161645	10	0.150484	10	0.146034	10	0.689701	8	0.165825	11	0.263917	11	0.300018	11	0.357383	10
Malawi	8.99E-02	12	7.00E-02	12	8.60E-02	12	1	4	7.40E-02	13	0.107066	12	8.32E-02	13	0.111215	13
Mauritius	1.241189	2	1.120178	2	1.082699	3	1.626146	1	1	3	1	4	1.307912	2	1	4
Mozambique	0.315181	9	0.169216	9	0.209562	9	0.501055	11	1	3	0.40478	10	0.343934	9	1	4
Namibia	1	4	1	3	1	4	1	4	1	3	1	4	1	4	1.114168	3
South Africa	1.672008	1	1	3	1.449529	1	1.101614	2	1.25817	1	1.153211	2	1.408923	1	1.256016	1
Turkey	1.066772	3	1.121301	1	1.167276	2	1.086143	3	1.034483	2	1.118028	3	1.279798	3	1.167033	2
Tanzania	0.697256	7	0.531585	8	0.291389	8	0.525096	10	0.297261	9	0.43506	8	0.307546	10	0.357848	9
Zambia	1	4	1	3	1	4	1	4	1	3	1	4	1	4	1	4
Zimbabwe	0.136545	11	0.120063	11	0.106562	11	8.40E-02	12	0.133569	12	0.427635	9	1	4	0.177127	11
Model Name = DEA-Solver LV(V8)/ (Super-BCC-O) Returns to Scale = Variable																

Table 4.8. .*DMUs mean score and overall rank for Super BCC-O model 2005-2012*

DMU	Mean Score	Overall Rank
Angola	0.542413	7
Botswana	1.3256548	1
Dem. Rep Congo	0.1050405	13
Madagascar	0.2793759	10
Malawi	0.2026726	12
Mauritius	1.1722655	3
Mozambique	0.492966	8
Namibia	1.014271	5
South Africa	1.2874339	2
Turkey	1.1301043	4
Tanzania	0.4303801	9
Zambia	1	6
Zimbabwe	0.2731876	11

More meaningful deductions can be made by looking at the averages of all the countries over the period. As table 4.8 can show Botswana was ranked the most preferable country in terms of its levels of outputs at the constant input factors. This is despite the fact that the model mostly encountered infeasible linear programming strings on the course of calculations for this DMU thereby giving a score of one. The second highest average super efficiency was achieved by South Africa which had all annual scores except one above one. Mauritius and Turkey follow as the next best super-efficient DMUs with averages of 1.172 and 1.13 respectively. Namibia was fifth at 1,014 and the only other DMU ranked as efficient was Zambia at efficiency score 1. However it is important to note that as Botswana, Namibia and Zambia encountered infeasible linear programming strings under this model in most of their years and as such a further analysis will be later carried out to verify any errors in classification.

Year on year inefficient DMUs as expected also yielded average super efficiency scores below one. None of these remaining DMUs logged a score above 0.6 and the

most n poor scores in comparison to the peer DMUs as they had average scores below 0.5 with the DRC being ranked last at 0.11.

4.2.3. Results on Super SBM-V model

In our methodology we sighted the possibility of the two models above running into infeasible liner programming constraints which is one of the major limitations of the two models above. However to check whether unsolved strings had an impact on the average ranking of DMUs we averaged scores from Super SBM-V which according to (Cooper, Seiford, & Tone, 2007, pp. 347-349) always has a finite optimum. This model as other super efficiency models allows for clearer distinction between efficient DMUs instead of just giving them a general score of 1.

We can see from table 4.9 that Botswana, Mauritius, South Africa and Turkey were the only DMUs consistently comparatively super-efficient through-out the years. In particular Botswana was totally unmatched in the first four years of analysis with super efficiencies of 2.98; 3.23; 2.505 and 2.39 consecutively, when no other DMU managed to obtain a score of 2 for the whole period 2005-2012. The lowest score achieved by Botswana was 1.544 in 2012 and this shows that though it was still efficient there were other DMUs who were closing down the comparison gap with increasing efficiency scores which represent more outputs and or reduced inputs compared to the previous years. The DMU which displayed this later described phenomenon was Zambia which was narrowly classified as inefficient in the first five years and there after crossing the threshold to be regarded as efficient. This shows that Zambia's given set of inputs and outputs improved in comparison to the other countries which reflects either an improvement in at least one of the indicators in the country or an average reduction in the favorability of the remaining DMUs.

Table 4.9. *Super SBM-V model super efficiency scores and rankings of DMUs from 2005-2012*

Super SBM-V model scores and ranks 2005-2012

	2005		2006		2007		2008		2009		2010		2011		2012	
DMU	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**
Angola	0.125411	7	0.232838	7	0.205094	7	0.28345	8	0.145205	8	0.14781	7	0.272462	8	0.180512	8
Botswana	2.980203	1	3.23024	1	2.505323	1	2.393807	1	1.722838	1	1.613506	1	1.672089	1	1.544056	1
Dem Rep Congo	4.67E-03	13	6.96E-03	13	4.09E-03	13	3.55E-03	12	2.18E-02	13	2.77E-02	13	2.36E-02	13	3.20E-02	13
Madagascar	1.15E-02	12	0.03587	10	5.81E-02	10	0.121616	10	0.06059	10	9.31E-02	9	0.102362	10	8.31E-02	11
Malawi	3.93E-02	10	3.57E-02	11	4.03E-02	11	0.99758	7	4.18E-02	12	3.83E-02	12	4.24E-02	12	3.36E-02	12
Mauritius	1.06926	4	1.034152	5	1.013202	4	1.083693	3	1.575151	2	1.28778	2	1.084281	5	1.283539	2
Mozambique	7.01E-02	9	6.25E-02	9	0.064527	9	9.60E-02	11	0.998969	7	6.49E-02	10	9.28E-02	11	0.999849	6
Namibia	1.300643	2	1.128115	3	0.99985	5	1.146276	2	1.104746	3	1.236202	3	1.163815	2	0.999514	7
South Africa	1.292598	3	1.336224	2	1.118269	2	1.048515	4	1.09142	4	1.052398	5	1.140934	3	1.072897	4
Turkey	1.023635	5	1.042985	4	1.061367	3	1.027155	5	1.011236	5	1.036473	6	1.078604	6	1.065034	5
Tanzania	0.105419	8	0.104769	8	0.110646	8	0.144834	9	0.116613	9	0.124303	8	0.118549	9	0.114266	9
Zambia	0.999644	6	0.999766	6	0.999676	6	0.999705	6	0.999815	6	1.096953	4	1.12686	4	1.102166	3
Zimbabwe	2.37E-02	11	2.08E-02	12	1.34E-02	12	1.63E-03	13	4.39E-02	11	6.19E-02	11	0.999814	7	9.33E-02	10

Model Name = DEA-Solver LV(V8)/ (Super-SBM-V) Returns to Scale = Variable

Besides being also regarded as inefficient by very small margins in only two years, Namibia was generally efficient. The remaining DMUs remained inefficient for the whole period despite some isolated, close to the threshold scores achieved by the Zimbabwe and Mozambique.

The average scores for this model from the period of study are presented in table 4.10. From the scores we can see that Botswana was ranked as averagely the most efficient DMU by a wide margin which was 86.6 percent better than the second highest average of 1.1788 achieved by Mauritius. South Africa had the next best average ranking, closely followed by Namibia in fourth. Turkey, though having more consistent efficient scores just above the threshold than Namibia, ranks fifth and the only other DMU averagely efficient was Zambia.

Table 4.10. *DMUs mean score and overall rank for Super SBM-V model 2005-2012*

DMU	Mean Score	Overall Rank
Angola	0.1990978	8
Botswana	2.2077578	1
Dem. Rep Congo	0.0155463	13
Madagascar	0.0707798	12
Malawi	0.1586225	9
Mauritius	1.1788823	2
Mozambique	0.3062056	7
Namibia	1.1348951	4
South Africa	1.1441569	3
Turkey	1.0433111	5
Tanzania	0.1174249	11
Zambia	1.0405731	6
Zimbabwe	0.1573055	10

The remainder of the DMUs showed very low averages below 0.5 which is way below the highest average score of 2.2. The DRC and Madagascar rank 13th and 12th respectively in this regard with average scores below 0.1 which shows that the countries had the most hostile environment for FDI in comparison to the other DMUs. Indifferently, Tanzania, Zimbabwe and Angola; showed averages below 0.2 which still translate into these countries having relatively unfavorable environments for FDI purposes.

4.2.4. Summary of the three models' results

Having analyzed the results of the models separately we compare their accuracy in classifying DMUs in general regardless of the scores achieved. The main reason for this comparison is that in Super BCC-I and Super BCC-O models there were DMUs which ran into infeasible strings of linear programming (LP) and as such the result retained may have affected the ranking of the country for a particular year or more.

Figure 4.5. *Summary of average efficiency scores from Super BCC-I, BCC-O and SBM-V models*

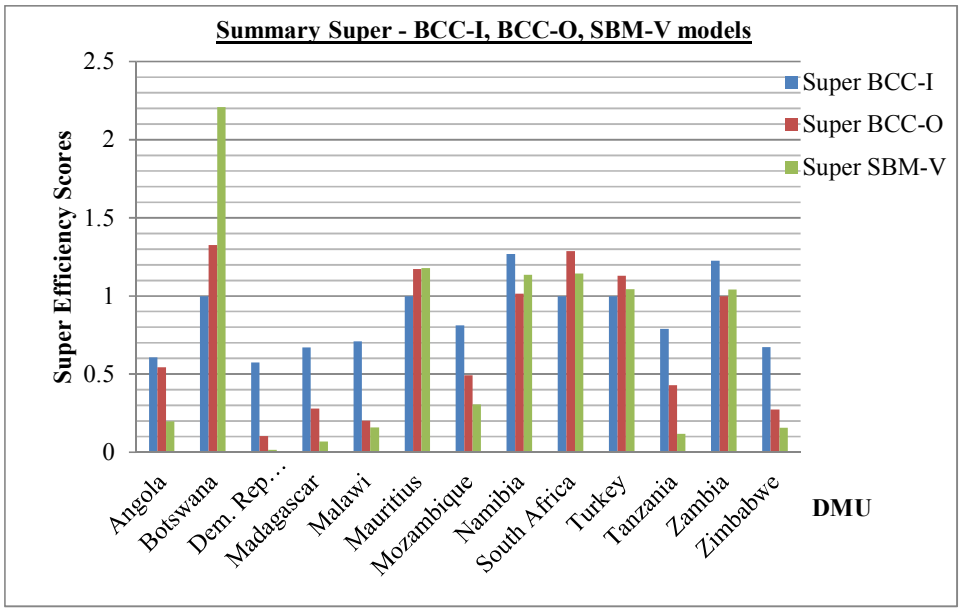


Figure 4.5 shows Botswana, Mauritius, Turkey, South Africa and Zambia had efficiency scores greater or equal to one for all the models despite the existence of infeasible LPs in some periods. However with the exception of Namibia and Zambia these DMUs logged infeasible LPs throughout the period for Super BCC-I model which makes their ranking difficult. Looking at the remaining models the graph shows that Botswana was averagely the most attractive destination for FDI over the period. For the DMUs classified below the threshold for all models we generally see that they achieved their best scores from the Super BCC-I model which is either a result of the LP constraints encountered by the DMUs just mentioned above or that the factors considered as inputs in this volume were combinedly variant to a lesser extent than the outputs.

5. CONCLUSIONS AND RECOMMENDATIONS

Having ranked the various countries selected in this study, we relate the obtained results to the initial objectives of the study. Recapping these objectives; we aimed to appraise the attractiveness of the FDI environments of countries of Southern Africa and Turkey by combining the various macroeconomic risk indicators that have been regarded as the most significant variables influencing FDI flows by various authors. Conclusions drawn in this chapter are therefore according to the results of the obtained models and the recommendations on modes of servicing the region of study are based on FDI theories as presented in the literature review.

5.1. Recommendation on Use of Study Results

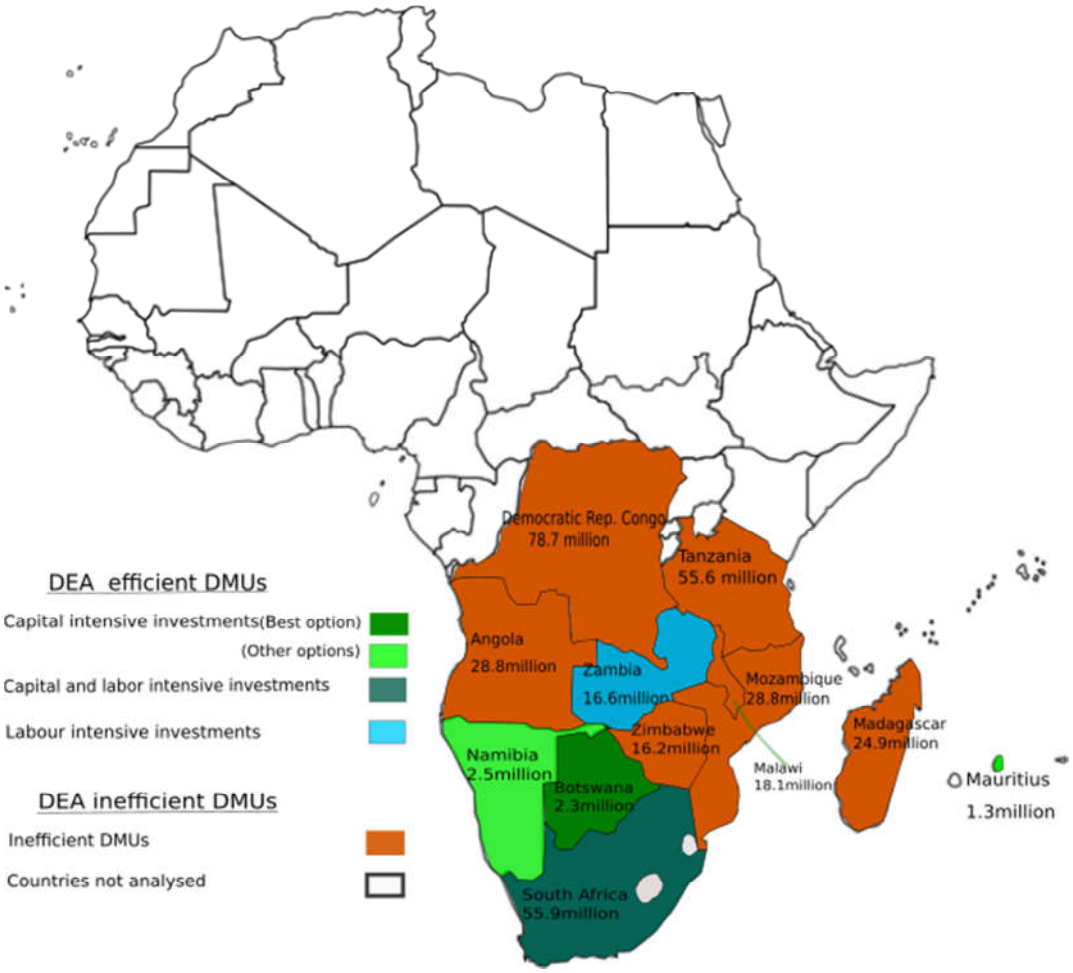
Since the method adopted in this work aims at giving the overall macroeconomic picture for FDI purposes for the period 2005-2012, the first recommendation for all concerned stakeholders is to update the results to the latest possible year according to availability of the data in order to obtain results most representative of the current situation. Furthermore, we recommend conduction of a complementary micro-risk analysis based on sectors of interest as this maybe a greater tool in finding high premium opportunities in countries considered as comparatively inefficient. As the variables used in the study were specifically representing factors influencing FDI flows, their use as a substitute for credit risk agencies ratings may lead to less accurate conclusions about countries since factors affecting mainly portfolio investments such as interest rates have been sidelined in this volume. We therefore recommend that the results obtained by using the adopted variables be used as complementary decision making information when being used for short investment decisions.

5.2. Directing Turkish FDI to DEA efficient countries

While acknowledging that there are intrinsic advantages associated with investing at home for Turkish investors, the kind which we can't incorporate to the efficiency score achieved for the DMU in this study to arrive at its much accurate attractiveness score, we still assess it against other countries in the other study on a level basis. The same reasoning is applied for countries which are endowed with specific location

advantages that can only be exploited by locating in that country for example extraction of rare raw materials. Although we prioritize the efficiency rankings obtained in this study for arriving at feasible conclusions, we also incorporate the demographics aspect to the result in giving our recommendation for citation of a regional industrial zone for Turkish investors in Southern Africa. Figure 5.1 shows the geographical locations of the DMUs in this study and their population with the exception of Turkey which was presented in detail in Chapter 1.

Figure 5.1. *Southern Africa study DMUs efficiency classes and their population: Data source United Nations Population Division.*



We can therefore look at the possible FDI strategies according to four groups of countries which are; countries ranked better than Turkey, DEA efficient countries

ranked below Turkey, inefficient countries with comparatively high population, low population inefficient countries.

5.2.1. Investing in DMUs ranked better than Turkey

The DMUs which were averagely ranked above Turkey by all models, disregarding scores generated after infeasible LPs, were Botswana, Mauritius and South Africa in order of preference. With a competitively high GDP per capita, reserves, low and stable inflation and total tax rate in direct comparison to Turkey itself we conclude in this study that Botswana is the most attractive FDI destination hence we recommend that most of the efforts by the Turkish investors aimed at investing in Southern Africa be directed to this country. As explained in Chapter 1, the creation of the Turkish Industrial Zone in Ethiopia serves as a key for a more secure expansion of its investments and markets into for example Sudan, Somalia and Yemen which are unfortunately continuously marred with sporadic internal clashes. In our case however, the less favorable FDI destinations are not characterized by this kind of menace but rather by lack of robust structural government policies which if well managed can be ameliorated to give a better environment. We therefore recommend that for a creation of an industrial zone in the southern part of the continent Botswana ought to be the first country of consideration for its localization.

A relatively high GDP per capita that Botswana possesses compared to all its neighbors together with the very small population of just around 2.3 million in 2016 by United Nations estimates, pose as discouraging factors to investors looking to venture in labor intensive production as well as any market seeking FDI as explained by the Dunning IDP stages in chapter two. The high GDP per capita generally translates into demand for high salaries which is means possible higher costs for a labor efficiency seeking investment. When this high per capita GDP is wheeled to a large population then the attractiveness of the country also becomes relatively higher for market seeking FDI as there is potentially high disposable income to purchase the produced good. This is not the case with Botswana and as such it is the best destination for capital intensive FDI ventures specializing good which can be easily exported to the neighboring countries.

Falling in the same category with Botswana is Mauritius which has lowest population of just about 1.3 million which measures as just 1.64 percent of Turkey's 79.51 million. It makes this second best ranked DMU favorable mainly for capital intensive FDI as labor supply is limited and potentially expensive due to this and also due to its second highest GDP per capita. Market seeking FDI will also most probably shy away from this destination because of the low population. On top of these drawbacks similar to Botswana's, being an island, Mauritius's location makes it difficult to produce bulky products due to much more limited space which logically demands more rent and also the cost of serving other markets through exports become relatively higher than those for Botswana. Consequently, this DMU is in our conclusion efficient for capital intensive, technology related FDI which only makes it come after Botswana on overall.

South Africa was the only other DMU marginally surpassing Turkey on average efficiency scores in models. For the study period South Africa has a lower average GDP per capita compared to Turkey yet, unlike Botswana and Mauritius, has a very useful population of around 55.9 million. This makes it a more luring destination for market seeking FDI as its corresponding GDP per capita is also relatively high which should mean more potential customers with higher disposable incomes. The average GDP per capita lower than that of Turkey, Mauritius and Botswana may result in lower wages than in these three countries as argued by other authors on GDP and wages. In such a case we declare South Africa the most favorable DMU for labor efficiency seeking Turkish FDI because of the large population and supposedly possible lower wages. It is also still a favorable destination for capital intensive FDI after Botswana and considering bulky production and access to other markets better than Mauritius. Just like Botswana South Africa borders Zimbabwe and additionally Mozambique which are inefficient DMUs which can be efficiently served through exports at lower costs because of their close proximity both geographically and socio-culturally. Assuming that all Turkish FDI investments are to be concentrated in only efficient DMUs and non-efficient DMUs served by other forms of market entry such as exporting, Madagascar's geographical positioning makes South Africa the best DMU to serve the market with bulky goods.

5.2.2. Investing in other efficient DMUs

For the DMUs which achieved better efficiency scores than Turkey in at least one model but not in all of them, disregarding the failed LP results, we consider them to be only partially better than Turkey in attractiveness of their FDI environment. Namibia is one case in particular being more efficient than Turkey under the SBM-V model and being ranked lower in the Super BCC-O model. For such DMUs we conclude that FDI in a form of expansion of already existing operations is suitable given that the other advantages of producing at home and exporting to the region have diminished. Namibia's population makes it also a difficult destination for market seeking FDI as well as labor efficiency seeking FDI.

Zambia is the only other DMU which was ranked as efficient but not ranked better than Turkey in two of the three models with the third one having an infeasible LP result for Turkey. The three most important characteristics of this DMU are; its closeness to six non-efficient DMUs, its relatively lower GDP per capita compared to other efficient DMUs and its important population in comparison to Botswana and Namibia. Having immediate borders with the inefficient DMUs which have very high population such as the DRC with 78.7 million, Tanzania at 55.7 and Angola and Mozambique tied at 28.8 million; Zambia presents itself as the most strategic efficient center to service the inefficient DMUs. The lower GDP per capita allows for relatively lower wages to be expected while its population of 16.6 million makes it more attractive for labor intensive FDI than Botswana and Namibia. The very low GDP per capita in most of these neighboring countries could mean the market is only important for fast moving consumer goods (FMCG) rather than durable goods. Combining these factors together we recommend that for low labor cost seeking bulky FMCG manufactures', the most efficient destination for FDI in Southern Africa is Zambia because of its proximity to the large markets of relatively inefficient DMUs as well as its potential low cost of labor in comparison to other efficient DMUs.

5.2.3. Investing in non-efficient DMUs

While we recommend that Turkish FDI be directed only to the efficient DMUs in general, this study is not meant to deter any flows directed to countries considered as

inefficient but rather to contribute in reducing macroeconomic risk through objective decision making tools. For most of the study we assumed the uniformity and ubiquity of natural endowments for all the DMUs. However the reality is that countries differ in these and as such FDI in special sectors which cannot be exploited from remote locations such as extraction of raw materials can only be done in countries where the target resource can be exploited more economically. In these particular cases Turkish investors have rather more limited choices hence FDI investments can by default flow to an inefficient DMU. Another special case in which FDI flows can be to an inefficient DMU is when there exist a possibility of higher premium returns arising from the countries being relatively riskier than the first choice efficient DMUs. This is because countries which are generally sidelined for their purported high risk for investments are characterized with potential less competition hence higher profit which can be one of the reasons why for example China is investing in Afghanistan (Xinhua, 2017) a country considered by most rating agencies as among the high risk countries.

Among the inefficient DMUs, the unique potential lies in the massive population of the DRC with a very low GDP per capita. If this combination results in low labor costs then the country has the potential to host most of the labor intensive Turkish FDI and serve the other DMUs through exporting. The other inefficient DMUs however outside location specific outright advantages do not possess any exceptional advantages on any of the factors analyzed in this study. For servicing these DMUs we recommend that different modes of entry be used other than FDI so as to exploit the potential presented in those markets. For a country like Zimbabwe which borders 3 efficient DMUs the most economic means of servicing the market depending with the country's customs regulations would be through exportation of capital intensive goods from Botswana and South Africa and labor intensive FMCG goods from South Africa and Tanzania. Mozambique can also be served by investment located in South Africa and Zambia with the same goods as proposed for Zimbabwe. Tanzania and the DRC and Angola having borders with Zambia can easily be serviced by exports of FMCG produced here in case of boosted investments as recommended in this study. For the capital intensive goods Botswana seems the closer option for Angola and DRC respectively. We recommend that bulky goods destined for Madagascar be produced in South Africa while technological goods be provided for by Mauritius. In addition to

servicing these DMUs through exports, investors may also use other modes of entry such as licensing as explained in (Carpenter & Dunung, 2011, pp. 382-385).

5.3. Recommendations for Efficient DMUs

Macroeconomic stability is a complex variable whose achievement does not follow a standard path. However for FDI purposes keeping the inputs used in this study to a minimum while maximizing the outputs gives such DMUs a competitive edge over the ones which struggle to keep that balance. On overall, over the years analyzed the efficient DMUs showed high consistency which was evidenced by less fluctuations of their efficiency scores with Zambia showing signs of improved policy implementation or and stability which translated into improved ranking over the most recent years in the study.

On a variable to variable basis but there remains isolated areas requiring special attention to policies in place for certain efficient DMUs. The first area of attention is the increased total tax rate on commercial profits from around 17 percent in the first five years of the study to 25.4 percent in the last year by the government of Botswana. Such an increase over a short period can cause panic among investors and trigger capital flight and as such the recommendation is for implementing a gradual tax increase policies. Among the efficient DMUs Mauritius had the highest average government debt to GDP ratio of 50.49 percent which is too high compared to Botswana's 13.2 percent. This high ratio increases speculation of the possibility of defaulting on debts which can be followed by a chain of the same events which led to the Asian crisis. For this reason the authorities have to implement policies regulating any further increase of this ratio and working to drive it lower. The DRC and Turkey are examples of DMUs which successfully drove down this ratio from 101.5 and 52.7 percent in 2005 to 23.17 and 36.16 in 2012 respectively. Turkey has nevertheless struggled to drive down the destruction of property due to demonstrations or terrorism probably because being entangled in the regional conflicts which make it a difficult problem to solve by simple unilateral policy implementation but still positive efforts need to be continued to drive such occurrences to the minimum.

5.4. Recommendations for Inefficient DMUs

Most of the countries regarded as inefficient recorded average scores way below one showing the existence of a comparatively very wide gap between them and the efficient DMUs. This gap is a result of inconsistency in at least one one of the inputs and or having at least one consistently high input compared to the DMU most frequent in the reference sets which in our case was Botswana. For Angola which has a better GDP per capita than Zambia, an efficient DMU, the inconsistency was mainly in its FDI stocks per capita which was on a continuous downward trend when all the other countries were enjoying steady or rising trends. Linked to this situation is the consistently high total tax rate on commercial profits which may have exacerbated the experienced negative FDI inflow rates. We recommend therefore that the government could look to cut down on the taxes as a way to slow down the FDI inflow decline and maybe further provide tax incentives encouraging companies to invest more. Needing to implement these same recommendations at an even larger scale is the DRC which had extremely heavy taxation as explained in chapter four. While as explained before the government here commendably managed to reduce its debt to GDP ratio very significantly over the years, it still needs to also drive down the instances of socio-political conflicts that result in property destruction.

The hyperinflation experienced by Zimbabwe in the study years before 2009, fluctuation of tax rates, government debt to GDP and total reserves are signs showing an almost haphazard policy implementation approach which creates a very volatile business environment. From such an approach the real source of the economic problems becomes masked hence more difficult to solve. We therefor recommend that the government shows some consistency in policy implementation as the first stage of closing the gap on the most efficient DMU. Appraising the results under a more consistent policy environment, panaceas can be drafted. Malawi showed an extreme rise of its debt to GDP ratio to almost 90 percent in 2012. This trend is a rising concern for the government as this 56 percent rise in the ratio corresponded to just 30 percent rise in the GDP per capita of the country. The government then has the task of reducing this ratio as it risks defaulting on payments because of its low GDP per capita. The remaining DMUs which were considered as inefficient do not show any extreme

inconsistencies in comparison to their peers in the same category but however the governments of these DMUs need to continue implementing policies aimed at minimizing the government debt, stabilizing their inflation rates and implementing clear and justifiably fair tax policies. With these efforts the existing efficiency gap between them and the efficient DMUs eventually closes.

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Government Debt to GDP percentage

	(I) Government Debt to GDP(%)								
DMU/Year	2005	2006	2007	2008	2009	2010	2011	2012	
Angola	35.737	18.697	16.066	16.647	22.71	44.291	33.801	29.487	27.180
Botswana	7.368	6.228	8.246	7.652	17.561	19.37	20.318	18.926	13.209
Dem. Rep Congo	101.472	104.302	86.885	90.505	93.187	31.942	26.25	23.169	69.714
Madagascar	86.467	37.367	32.75	31.49	33.678	31.69	32.181	33.029	39.832
Malawi	39.164	46.872	47.383	40.17	42.613	62.86	88.469	89.47	57.125
Mauritius	53.530	51.015	47.283	44.03	52.269	52.038	52.279	51.473	50.490
Mozambique	70.158	46.611	35.99	36.283	41.887	43.326	38.026	40.098	44.047
Namibia	26.049	23.897	19.388	18.243	15.947	15.502	23.248	23.388	20.708
South Africa	33.212	31.355	27.061	26.506	30.078	34.675	38.227	40.999	32.764
Turkey	52.710	46.524	39.907	39.984	46.073	42.335	39.142	36.158	42.854
Tanzania	46.755	32.841	21.598	21.515	24.359	27.343	27.842	29.151	28.926
Zambia	16.718	24.999	21.932	19.196	20.522	18.892	20.803	24.911	20.997
Zimbabwe	38.575	44.715	50.061	68.864	68.294	63.192	51.761	56.73	55.274

Foreign Direct Investment stocks per capita (current $)

		Foreign Direct Investment stocks per capita (current $)						
	2005	2006	2007	2008	2009	2010	2011	2012
Angola	911.9942274	879.04505	803.0399	861.01187	940.03972	756.95266	594.22814	270.69006
Botswana	892.7358525	1050.6248	1297.9826	1257.4127	1500.5435	1636.1903	1968.4438	2260.0226
Dem. Rep Congo	35.19494495	38.500064	67.489399	93.271808	100.69475	142.07338	162.36543	204.39524
Madagascar	13.68470444	39.506914	91.551502	139.8424	192.61776	207.90816	226.70281	253.44124
Malawi	48.19546101	49.958766	57.807755	70.293519	71.777302	77.848548	76.506398	74.323044
Mauritius	658.5442297	741.25489	1013.0617	1318.2551	2426.5533	3732.7992	2392.9866	2557.3585
Mozambique	125.8464497	130.5546	143.71134	162.8073	158.51095	189.32962	326.31177	535.99519
Namibia	1210.364466	1356.3347	1850.2913	1674.4371	1994.6621	2431.506	2300.4256	1571.0707
South Africa	1999.738974	2180.9865	2652.8805	1661.3856	2721.0292	3478.4825	3051.2723	3094.5978
Turkey	1051.007243	1384.5773	2232.0205	1143.8302	2018.5428	2588.161	1858.5633	2540.562
Tanzania	113.6242628	119.89812	143.29992	162.1109	178.612	212.75605	232.18811	261.9121
Zambia	449.1185395	465.86406	543.27467	553.31719	563.13207	534.04222	585.19014	747.13215
Zimbabwe	106.5161334	108.39856	112.19527	114.37548	120.14797	129.84567	154.42712	178.56944

GDP per capita (Current international $)

	(O) GDP per capita(Current international $)							
	2005	2006	2007	2008	2009	2010	2011	2012
Angola	3838.264572	4614.5908	5613.2322	6298.0124	6284.2749	6360.849	6524.4812	6758.278
Botswana	10268.51134	11277.62	12310.291	13081.998	11934.057	12854.161	13634.263	14210.962
Dem. Rep Congo	476.737205	501.11543	529.22187	554.88836	556.728075	584.26005	617.14796	652.38859
Madagascar	1240.334971	1304.4446	1382.7105	1468.2103	1380.56592	1362.2988	1371.6486	1399.5139
Malawi	765.2237114	802.84574	877.5051	934.93153	990.261362	1039.2895	1078.8556	1085.679
Mauritius	11078.02724	12335.635	13328.341	14270.169	14815.808	15616.007	16561.771	17408.189
Mozambique	654.6779387	720.42397	772.42577	818.48047	852.859303	895.49966	951.82536	1010.2213
Namibia	6480.580238	7058.5136	7617.3503	7849.9995	7797.9282	8212.3293	8625.7179	9021.9129
South Africa	9847.832856	10577.942	11289.429	11716.719	11462.6155	11785.605	12243.879	12556.748
Turkey	11457.9926	13106.714	14228.522	15355.911	14794.5112	16541.991	18269.838	18560.178
Tanzania	1634.893131	1711.3887	1847.8646	1927.689	1983.22286	2068.4885	2206.9108	2289.2619
Zambia	2212.044281	2393.0644	2587.3147	2761.6553	2950.71259	3197.3807	3342.6539	3553.1158
Zimbabwe	1472.435072	1449.1201	1415.0277	1170.4619	1229.38242	1360.876	1523.6218	1679.1256

(I) Inflation (Consumer Price Index)

		(I) Inflation(Consumer Price Index)						
DMU/Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Angola	22.96	13.30	12.25	12.47	13.73	14.47	13.47	10.29
Botswana	8.61	11.56	7.08	12.70	8.03	6.95	8.46	7.54
Dem. Rep Congo	21.32	13.05	16.95	17.30	2.80	7.10	15.32	9.72
Madagascar	18.51	10.77	10.30	9.22	8.96	9.25	9.48	6.36
Malawi	15.41	13.97	7.95	8.71	8.42	7.41	7.62	21.27
Mauritius	4.94	8.93	8.80	9.73	2.55	2.89	6.53	3.85
Mozambique	7.17	13.24	8.16	10.33	3.25	12.70	10.35	2.68
Namibia	2.28	4.96	6.55	9.09	9.45	4.87	5.01	6.72
South Africa	3.40	4.64	7.10	11.54	7.13	4.26	5.00	5.65
Turkey	10.14	9.60	8.76	10.44	6.25	8.57	6.47	8.89
Tanzania	5.03	7.25	7.03	10.28	12.14	6.20	12.69	16.00
Zambia	18.32	9.02	10.66	12.45	13.40	8.50	6.43	6.58
Zimbabwe	302.12	1096.68	24411.03	1600.00	1000.00	3.03	3.28	3.92

Total reserves in months of imports

	(O) Total reserves in months of imports							
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Angola	1.997942206	4.5632508	3.8915734	3.7448093	3.3611382	5.4303888	6.4200629	7.0947231
Botswana	15.8706255	20.571457	19.599212	15.725211	17.479122	12.863487	11.300661	10.153577
Dem. Rep Congo	0.404533299	0.4842241	0.314167	0.105249	1.6410527	1.3071666	1.1636477	1.6224632
Madagascar	2.565407945	2.8001908	2.8621552	2.3880335	2.8984833	3.3948864	3.3904036	2.9913384
Malawi	1.426500842	1.2164049	1.6851599	1.4127399	0.8302005	1.3772481	0.7984794	1.1292267
Mauritius	3.841626806	3.1104468	3.7778806	3.1022845	5.0395112	2.7618727	3.8440249	4.0629211
Mozambique	3.950244196	3.4810202	4.107242	3.6852492	5.3431253	5.2068872	3.8866762	2.8187759
Namibia	1.228951979	1.6387557	2.655173	3.007439	4.5637211	3.079522	3.0647556	2.5937097
South Africa	3.161143945	3.2325678	3.4581402	3.3225444	5.1118121	4.5487089	4.1929077	4.3354694
Turkey	4.740216042	4.8063848	4.7891395	3.8896251	5.447336	4.9417844	3.9911614	5.487161
Tanzania	5.297548722	5.1971672	5.1977526	3.7706247	5.1958664	4.7851241	3.4754764	3.6334366
Zambia	2.111944537	1.9915927	2.1919954	1.9283691	5.0350913	3.6050515	3.1998993	3.8015738
Zimbabwe	0	0	0	0	2.334669	1.3318096	0.8315168	0.7953877

Threat to Property

		(I) Threat to Property						
	2005	2006	2007	2008	2009	2010	2011	2012
Angola	0	0	0	0	4	4	0	0
Botswana	0	0	0	0	0	0	0	0
Dem. Rep Congo	8	10	6	27	183	31	12	15
Madagascar	0	0	0	0	4	0	0	3
Malawi	0	0	0	0	0	0	0	0
Mauritius	0	0	0	0	0	0	0	0
Mozambique	0	0	0	0	0	0	0	0
Namibia	0	0	0	0	0	0	0	0
South Africa	0	0	0	4	0	0	0	3
Turkey	79	68	31	62	35	37	70	172
Tanzania	0	0	0	0	0	0	0	0
Zambia	0	0	0	0	0	0	0	0
Zimbabwe	0	0	0	10	0	0	0	0

Total tax rate (% of commercial profits)

	(I) Total tax rate (% of commercial profits)							
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Angola	52.2	52.2	52.2	52.2	52.2	52.2	52.3	52.3
Botswana	17.1	17.1	17.1	17.1	17	19.5	19.5	25.4
Dem. Rep Congo	288.1	288.1	288.1	263.3	292.7	339.1	339.1	339.1
Madagascar	45.3	45	45	47.1	42.8	42	41.2	39.8
Malawi	33.4	33.4	33	32.2	26.3	25.9	29	32.4
Mauritius	26.2	26	24.2	25.8	26	26.5	25.8	26.9
Mozambique	37	37	37	37	37	37	37	37
Namibia	25.8	25.8	25.8	22.8	22.3	22.3	21.8	21.8
South Africa	37.1	36.6	36.1	33.3	30	30.2	31.8	32
Turkey	53.1	52.7	44.5	44.5	43.5	43.5	40.2	40.2
Tanzania	43.8	43.8	43.9	44.4	44.4	44.4	44.9	44.9
Zambia	15.4	15.4	15	15	15	14.3	14.4	16.2
Zimbabwe	30.1	30.2	49.3	66.3	36.1	37	32.5	32.7

Example: 2006 Super SBM-V Model Work Sheet: Worksheet 1: DATA

	(I) Government Debt to GDP(%)	(I) Inflation(cpi)	(I) Total tax rate (% of commercial profits)	(I) Threat to Property	(O) FDI Stocks	(O) GDP per capita(Current international $)	(O) Total reserves in months of imports
Angola	18.697	13.30325336	52.2	0	879.0450508	4614.590809	4.563250764
Botswana	6.228	11.55521879	17.1	0	1050.624836	11277.62022	20.57145678
Dem. Rep Congo	104.302	13.05269497	288.1	10	38.50006366	501.115433	0.484224075
Madagascar	37.367	10.77224539	45	0	39.50691394	1304.444605	2.80019081
Malawi	46.872	13.97429435	33.4	0	49.95876611	802.8457436	1.216404874
Mauritius	51.015	8.932648402	26	0	741.2548851	12335.63549	3.110446762
Mozambique	46.611	13.23866387	37	0	130.5545997	720.4239655	3.481020203
Namibia	23.897	4.961166893	25.8	0	1356.334741	7058.513564	1.638755652
South Africa	31.355	4.641624894	36.6	0	2180.986511	10577.94237	3.232567753
Turkey	46.524	9.597242123	52.7	68	1384.577342	13106.71356	4.806384796
Tanzania	32.841	7.250972621	43.8	0	119.8981234	1711.3887	5.19716715
Zambia	24.999	9.019572472	15.4	0	465.8640558	2393.064359	1.991592714
Zimbabwe	44.715	1096.677633	30.2	0	108.3985593	1449.120124	0

Worksheet 2: Summary

Workbook Name = E:\fazh\Thesis\regional risk analysis\DATA\GAGA CREATED\D\2006 dea sheet Super SBM-V.xlsx
Data File = E:\fazh\Thesis\regional risk analysis\DATA\GAGA CREATED\D\2006 dea sheet.xlsxDATA
DEA model = DEA-Solver LV(V8)/ Super-SBM NonOriented(Super-SBM-V)
Problem =

No. of DMUs = 13
No. of Input items = 4
Input(1) = Government Debt to GDP(%)
Input(2) = Inflation(cpi)
Input(3) = Total tax rate (% of commercial profits)
Input(4) = Threat to Property
No. of Output items = 3
Output(1) = FDI Stocks
Output(2) = GDP per capita(Current international $)
Output(3) = Total reserves in months of imports

Returns to Scale = Variable (Sum of Lambda = 1)

Statistics on Input/Output Data

	Governmen	Inflation(cp	Total tax rat	Threat to P	FDI Stocks	GDP per ca	Total reserves in months of imports
Max	104.302	1096.6776	288.1	68	2180.9865	13106.714	20.571457
Min	6.228	4.6416249	15.4	0	38.500064	501.11543	0
Average	39.647923	93.613633	54.1	6	657.3465	5219.4938	4.0841125
SD	22.56923	289.5747	68.503801	18.093773	655.61323	4754.4296	5.005607

Correlation

	Governmen	Inflation(cp	Total tax rat	Threat to P	FDI Stocks	GDP per ca	Total reserves in months of imports
Governmen	1	0.0679597	0.8425938	0.2098652	-0.4078604	-0.3163245	-0.5269617
Inflation(cp	0.0679597	1	-0.0974582	-0.0957039	-0.2480009	-0.2333034	-0.2345427
Total tax rat	0.8425938	-0.0974582	1	0.1393126	-0.2677617	-0.2938816	-0.2455004
Threat to P	0.2098652	-0.0957039	0.1393126	1	0.2805426	0.4373898	0.0111394
FDI Stocks	-0.4078604	-0.2480009	-0.2677617	0.2805426	1	0.8123773	0.2614034
GDP per ca	-0.3163245	-0.2333034	-0.2938816	0.4373898	0.8123773	1	0.4657638
Total reserv	-0.5269617	-0.2345427	-0.2455004	0.0111394	0.2614034	0.4657638	1

DMUs with inappropriate Data with respect to the chosen Model

No.	DMU
	None

No. of DMU	13
Average	0.7131435
SD	0.8818727
Maximum	3.2302404
Minimum	0.0069575

Frequency in Reference Set

Reference	Frequency to other DMUs
Botswana	5
Mauritius	0
Namibia	0
South Afric	3
Turkey	0
Zambia	0

No. of DMUs in Data =	13
No. of DMUs with inappropriate Data =	0
No. of evaluated DMUs =	13
Average of scores =	0.7131435
No. of efficient DMUs =	5
No. of inefficient DMUs =	8
No. of over iteration DMUs =	0

[Super-SBM-V] LP started at 12-06-2017 00:42:00 and completed at 12-06-2017 00:42:01

Worksheet 3: Score

Model Name = DEA-Solver LV(V7)/ Super-SBM NonOriented(Super-SBM-V) Returns to Scale = Variable (Sum of Lambda = 1)

Workbook Name = E:\fazh\Thesis\regional risk analysis\DATA\GAGA CREATED\D\2006 dea sheet Super SBM-V.xlsx

No.	DMU	Score	Rank	Reference set (lambda)							
1	Angola	0.23283765	7	Botswana	1						
2	Botswana	3.23024039	1	Namibia	1						
3	Dem. Rep C	6.96E-03	13	South Afric	1						
4	Madagasca	0.03587005	10	South Afric	1						
5	Malawi	3.57E-02	11	Botswana	1						
6	Mauritius	1.03415214	5	Botswana	0.58484675	South Afric	0.36518358	Turkey	5.00E-02		
7	Mozambiqu	6.25E-02	9	Botswana	1						
8	Namibia	1.12811531	3	Botswana	0.21886334	South Afric	0.47302294	Zambia	0.30810372		
9	South Afric	1.33622373	2	Botswana	0.02568138	Namibia	0.62465829	Turkey	0.34966033		
10	Turkey	1.04298518	4	Botswana	9.41E-02	Mauritius	0.4792511	South Afric	0.4266054		
11	Tanzania	0.10476883	8	Botswana	0.11330596	South Afric	0.88669404				
12	Zambia	0.99976601	6	Zambia	1						
13	Zimbabwe	2.08E-02	12	Botswana	1						

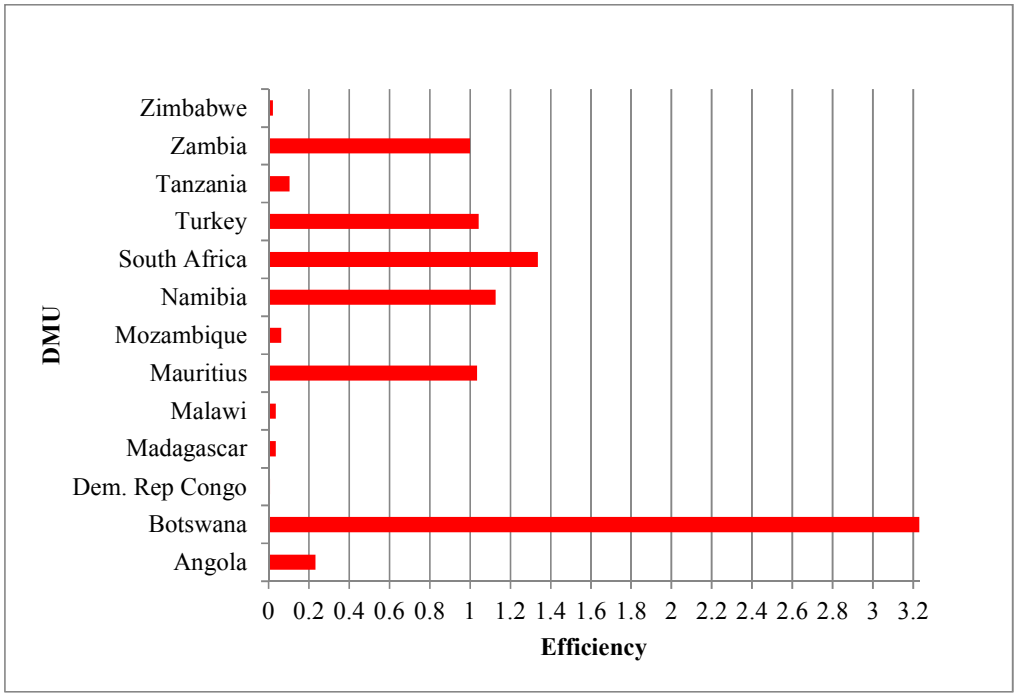
Worksheet 4: Rank

Model Name = DEA-Solver LV(V7)/ Super-SBM NonOriented(Super-SBM-V)

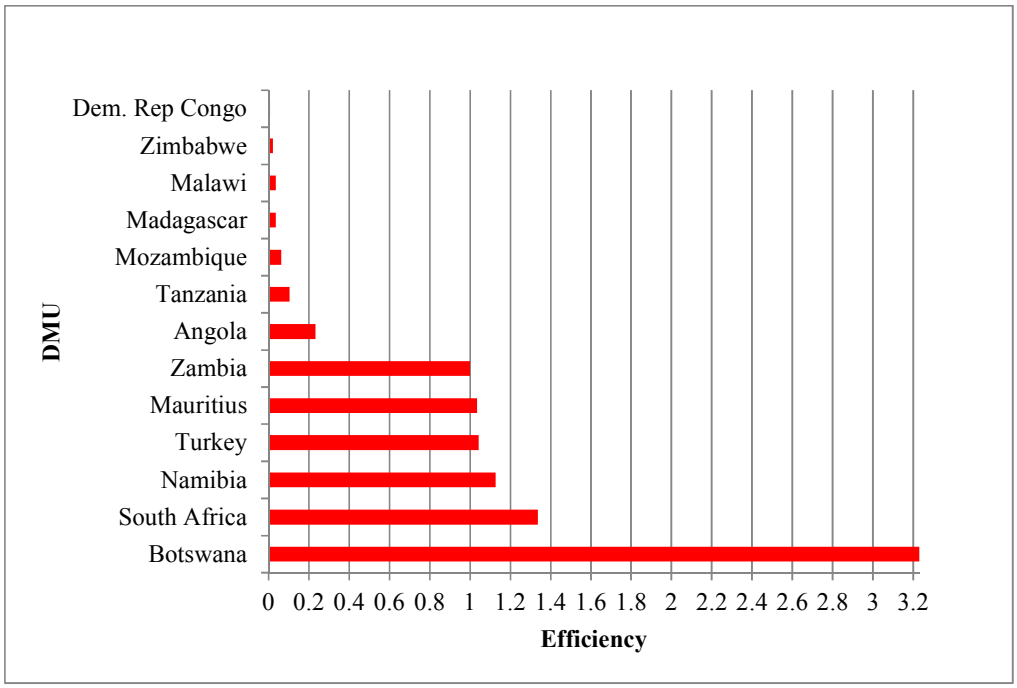
Workbook Name = E:\fazh\Thesis\regional risk analysis\DATA\GAGA CREATED\D

Rank	DMU	Score
1	Botswana	3.23024039
2	South Afric	1.33622373
3	Namibia	1.12811531
4	Turkey	1.04298518
5	Mauritius	1.03415214
6	Zambia	0.99976601
7	Angola	0.23283765
8	Tanzania	0.10476883
9	Mozambiqu	6.25E-02
10	Madagasca	0.03587005
11	Malawi	3.57E-02
12	Zimbabwe	2.08E-02
13	Dem. Rep C	6.96E-03

Worksheet 5: Graph 1



Worksheet 6: Graph 2



Worksheet 7: Slack

Model Name = DEA-Solver LV(V7)/ Super-SBM NonOriented(Super-SBM-V) Returns to Scale = Variable (Sum of Lambda = 1)

Workbook Name = E:\fazh\Thesis\regional risk analysis\DATA\GAGA CREATED\D\2006 dea sheet Super SBM-V.xlsx

No.	DMU	Score	Excess Government S-(1)	Excess Inflation(cp S-(2)	Excess Total tax rat S-(3)	Excess Threat to Pr S-(4)	Shortage FDI Stocks S+(1)	Shortage GDP per cap S+(2)	Shortage Total reserves in S+(3)
1	Angola	0.23283765	12.469	1.74803457	35.1	0	171.579785	6663.02941	16.008206
2	Botswana	3.23024039	17.668761	0	8.699742	0	0	4219.17724	18.9327175
3	Dem. Rep C	6.96E-03	72.947	8.41107008	251.5	10	2142.48645	10076.8269	2.74834368
4	Madagasca	0.03587005	6.012	6.1306205	8.4	0	2141.4796	9273.49777	0.43237694
5	Malawi	3.57E-02	40.644	2.41907556	16.3	0	1000.66607	10474.7745	19.3550519
6	Mauritius	1.03415214	0	0	0	3.3979376	0	1222.12694	0
7	Mozambiqu	6.25E-02	40.383	1.68344508	19.9	0	920.070236	10557.1963	17.0904366
8	Namibia	1.12811531	0	2.54240578	0	0	0	0	0
9	South Afric	1.33622373	0	2.10993793	0	23.7769024	822.627504	1296.26073	0
10	Turkey	1.04298518	0	0	0	0	0	1620.52471	0
11	Tanzania	0.10476883	4.33303876	1.82599636	9.40946614	0	1933.01168	8945.83134	0
12	Zambia	0.99976601	1.14E-03	0	0	0	2.92E-02	0.42672356	8.50E-04
13	Zimbabwe	2.08E-02	38.487	1085.12241	13.1	0	942.226277	9828.50009	20.5714568

Worksheet 8: Weight

Model Name = DEA-Solver LV(V7)/ Super-SBM NonOriented(Super-SBM-V) Returns to Scale = Variable (Sum of Lambda = 1)

Workbook Name = E:\fazh\Thesis\regional risk analysis\DATA\GAGA CREATED\D\2006 dea sheet Super SBM-V.xlsx

No.	DMU	Score		V(1) Goven	V(2) Inflatic	V(3) Total t	V(4) Threat to Property		U(1) FDI St	U(2) GDP p	U(3) Total reserves in
1	Angola	0.23283765		1.34E-02	1.88E-02	4.79E-03	0		8.83E-05	1.68E-05	1.70E-02
2	Botswana	3.23024039		3.85E-04	1.97E-05	5.07E-05	0		1.45E-07	2.26E-09	7.88E-04
3	Dem. Rep C	6.96E-03		2.40E-03	1.92E-02	8.68E-04	0.025		6.02E-05	4.63E-06	4.79E-03
4	Madagasca	0.03587005		6.69E-03	2.32E-02	5.56E-03	0		3.03E-04	9.17E-06	4.27E-03
5	Malawi	3.57E-02		5.33E-03	1.79E-02	7.49E-03	0		2.38E-04	1.48E-05	9.77E-03
6	Mauritius	1.03415214		4.70E-05	3.37E-04	3.34E-05	2.10E-04		2.06E-07	9.72E-08	5.21E-03
7	Mozambiqu	6.25E-02		5.36E-03	1.89E-02	6.76E-03	0		1.60E-04	2.89E-05	5.99E-03
8	Namibia	1.12811531		1.00E-04	6.70E-04	2.73E-04	0		1.13E-07	3.60E-09	9.89E-03
9	South Afric	1.33622373		7.64E-05	2.18E-04	2.37E-05	0		1.98E-07	2.40E-09	5.01E-03
10	Turkey	1.04298518		5.15E-05	2.38E-05	1.65E-05	5.41E-05		6.89E-07	4.90E-08	3.37E-03
11	Tanzania	0.10476883		7.61E-03	3.45E-02	5.71E-03	0		2.91E-04	2.04E-05	1.45E-02
12	Zambia	0.99976601		1.00E-02	1.484755	0.69850192	0		7.15E-04	1.39E-04	0.16733107
13	Zimbabwe	2.08E-02		5.59E-03	2.28E-04	8.28E-03	0		6.39E-05	4.78E-06	1.46E-02