USING ORDINARY LEAST SQUARES TO MEASURE THE IMPACT OF THE FACTORS AFFECTING UNDERGROUND ECONOMY: A COMPARISON BETWEEN BANGLADESH, INDIA, PAKISTAN AND TURKEY

Master's Degree Thesis

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ÖZET

EN KÜÇÜK KARELER YÖNTEMINE GÖRE KAYIT DIŞI EKONOMİYİ ETKILEYEN FAKTÖRLERİN, PAKİSTAN, HİNDİSTAN, BANGLADEŞ VE TÜRKİYE İÇİN KARŞILAŞTIRILMASI

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Kayıt dışı ekonominin, tüm ekonomilerde hem ekonomik yapı hemde ekonomi politikaları üzerinde olumsuz etkileri gözlenmektedir. Günümüze kadar yapılan çalışmalarda ve araştırmalarda ağırlıklı olarak gelişmiş ülkelerdeki kayıt dışı ekonomilere odaklanılarak büyüklüğü ölçülmüştür. Ancak aynı zamanda gelişmekte olan ülkeler içinde kayıt dışı ekonominin ölçülmesine takip edilmesine ve öneriler getirilmesine ihtiyaç duyulmaktadır.

Bu çalışma gelişmekte olan ülkelerin kayıt dışı ekonomi boyutlarının neden büyük oranlarda olduğundan yola çıkarak: birinci bölümde kayıt dışı ekonomi kavramının tanımı, nedenleri ve önemi ile birlikte bu çalışmanın amaçları ele alınmış, çalışmanın ikinci bölümünde ise literatür taraması yapılmıştır. Üçüncü, dördüncü ve beşinci bölümde; 2000-2013 yıllarını kapsayan ikinci kaynaklardan elde edilen veri kullanılarak en küçük kareler yöntemine göre; vergi gelirinin, işsizlik oranının, ekonomik özgürlük endekslerinin, nüfusun ve Gayri Safi Yurt İçi Hasıla büyümesinin, enflasyonun ve internet kullanıcılarının Bangladeş, Hindistan, Pakistan ve Türkiye'nin kayıt dışı ekonomileri üzerindeki etkisi test edilmiştir.

Çalışmanın son bölümünde ise, ele aldığımız, ülkeler karşılaştırıldığında, ekonomik özgürlük endekslerinin bu çalışmadaki tüm ülkerler için önemli olduğu ve kayıt dışı ekonominin boyutunun azaltılmasında yüksek kurumsal niteliklerin kaçınılmaz olduğunu göstermiştir. Geniş bir vergi tabanı ve basit vergi sistemi Bangladeş, Hindistan ve Pakistan'a yardımcı olurken bilişim ve iletişim teknolojileri kullanımında şeffaflik

Bangladeş, Pakistan ve Türkiye'de kayıt dışı ekonomilerinin boyutunu azaltmaya yardımcı olacaktır.

Anahtar Sözcükler: Kayıt Dışı Ekonomi, En Küçük Kareler, Gelişmekte Olan Ülkeler

ABSTRACT

USING ORDINARY LEAST SQUARES TO MEASURE THE IMPACT OF THE FACTORS AFFECTING UNDERGROUND ECONOMY: A COMPARISON BETWEEN BANGLADESH, INDIA, PAKISTAN AND TURKEY

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Shadow economy is a source of concern since it distorts policy framework of a country and weakens the government. Previous studies have mainly focused on shadow economies of developed countries and have measured its size. This study sheds light on developing countries which are in dire need of policies that tackle this issue and identifies the reasons as to why these countries have large shadow economies in the first place.

Using secondary data from 2000-2013 and applying Ordinary Least Squares (OLS) regression model, this study tests the impact of tax revenue, unemployment rate, Index of Economic Freedom, population and GDP growth rates, inflation and internet users on the shadow economies of Bangladesh, India, Pakistan and Turkey in absolute and comparative dimensions.

In the first part of the study, the concept and significance of underground economy along with the objectives of this study are discussed, the second part of the study comprises literature review. The third, fourth and fifth parts of the study use OLS to estimate the impact of aforementioned variables on the size of shadow economy. It has been found that Index of Economic Freedom has the most significant impact on all the countries. Wider tax base and a simple tax system will facilitate Bangladesh, India and Pakistan while greater transparency in the usage of ICT will enable Bangladesh, Pakistan and Turkey to reduce the size of their shadow economies.

Keywords: Shadow Economy, OLS, Developing Countries

PREFACE

Shadow economy is one of the responsible factors for the slow pace of economic growth, high levels of corruption, weak fiscal framework and low quality of public goods and services in many countries today.

The aim of this study was to take a closer look at the shadow economies of economically emerging developing countries. By looking at the factors that determine the size of shadow economies in these countries, this study has tried to recommend policies which can target those determinants directly and consequently help curtail the severity of this problem.

I would like to sincerely thank and appreciate my supervisor Asst. Prof. Dr. Zeynep Erdinç for her kind support, patience and guidance throughout my thesis and for facilitating me in successful completion of my work. I would also like to express my gratitude to my family and friends for their prayers, support and encouragement throughout my work.

Last but not the least, I would like to humbly thank Turkish government for providing me an opportunity to study in one of their prestigious universities. It has been a learning experience along multiple dimensions and has added to my personal growth and development.

ETIK VE KURALLARA UYGUNLUK BEYANNAMESI

Bu tezin bana ait, özgün bir çalışma olduğunu; çalışmamın hazinlik, veri toplama, analiz ve bilgilerin sunumu olmak üzere tüm aşamalardan bilimsel etik ilke ve kurallara uygun davrandığımı; bu çalışma kapsamında elde edilmeyen tüm veri ve bilgiler için kaynak gösterdiğmi ve bu kaynaklara kaynakçada yer verdiğimi; bu çalışmanın Anadolu Üniversitesi tarafından kullanılan "bilimsel intihal tespit programıyla tarandığını ve hiçbir şekilde "intihal içermediğini" beyan ederim. Herhangi bir zamanda, çalışmamla ilgili yaptığım bu beyana aykırı bir durumun saptanması durumunda, ortaya çıkacak tüm ahlaki ve hukuki sonuçlara razı olduğumu bildiririm.

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LIST OF ABBREVIATIONS

CPI	: Consumer Price Index
DIY	: Do-it-yourself
DW	: Durbin-Watson
DYMIMIC	: Lagged Multiple Indicator, Multiple Cause
GDP	: Gross Domestic Product
GNP	: Gross National Product
GSYİH	: Gayri Safi Yurt İçi Hasila
ICRG	: International Country Risk Guide
ICT	: Information Communications Technology
IMF	: International Monetary Fund
MIMIC	: Multiple Indicator, Multiple Cause
MTR	: Marginal Tax Rate
NTBs	: Non-tariff Barriers
OECD	: Organization for Economic Co-operation and Development
OLS	: Ordinary Least Squares

1. INTRODUCTION

Underground economy, like all the black markets throughout the world, was created due to government rules and regulations. It is an output of income tax and of other taxes, of limitations in the labor market and of prohibitions on certain activities (Gutmann, 1977). The rise of the underground economy started in 1970s when the presence of government activity became stronger in economies around the world. With the increase in the size of public sector, the financing of public sector programs began through taxation and the desire to escape taxes and regulations gained prominence (Chaudhuri, Schneider, & Chattopadhyay, 2006). The rapid pace of inevitable globalization today has stimulated increasing volumes of global trade which has meant greater influence of countries on each other and while this has tremendous benefits, it is also one of the factors responsible for large shadow economies across the globe (Ucok, 2015). This notion therefore invites greater attention of government and policy makers.

Although shadow economy exists in both developed and developing countries, it is relatively more prevalent in the latter due to which these countries are experiencing slow economic growth, eroded tax base, distortions in fiscal and public policies and an overall low quality of public goods and services (Dabla-norris, Gradstein, & Inchauste, 2008). The literature on shadow economy has, however, paid more attention to the developed countries which is another source of concern since it is the developing countries whose shadow economies need to be looked at closely. Furthermore, main focus of researches to date has been on the measurement of shadow economy but its determinants also need to be looked at so that policies can directly target those root causes which can eventually curtail the size of underground economies. Consequently, from the extensive literature on underground economies of both developed and developing countries, this study has chosen a small set of economically emerging developing countries in Asia with the aim of inspecting some of the determinants of their underground economies.

1.1 Introduction of the Topic and Defining Underground Economy

This study aims to take the determinants of underground economy for four Asian economies namely Bangladesh, India, Pakistan and Turkey into consideration in order to examine the extent to which these factors have an impact on the size of their underground

economy in absolute and comparative dimensions. The study will use underground economy as a dependent variable and a set of independent variables (explained later in the study) for the analyses.

Before diving deep into the pool of underground economy, it is important to explain what it means. There is no universal definition of underground economy (Friedrich Schneider, 2004b) like there is no universal term for its concept. In the literature, underground economy goes by several names; shadow, informal, unobserved, unrecorded, black and unofficial economy that refers to all the activities which are out of government's reach (Chaudhuri et al., 2006). Like mainstream economy, underground economy produces goods and services, generates income and employs labor however unlike official economy, the output from this sector is neither taxed nor recorded or regulated (Weiss, 1987). Underground economy includes both legal and illegal activities. The types of activities which comprise underground economy are illustrated as under:

Table 1.1. *Activities in the Shadow Economy*

Type of Activity	Monetary Transactions		Non Monetary Transactions	
ILLEGAL ACTIVITIES	Trade with stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling; fraud; etc.		Barter of drugs, stolen goods, smuggling etc. Produce or growing drugs for own use. Theft for own use.	
	Tax Evasion	Tax Avoidance	Tax Evasion	Tax Avoidance
LEGAL ACTIVITIES	Unreported income from self-employment; wages, salaries and assets from unreported work related to legal services and goods	Employee discounts, fringe benefits	Barter of legal services and goods	All do-it-yourself work and neighbour help
1. Structure of the table is taken from Lippert and Walker ([1997], p. 5) with additional remarks.				

NB: This table is taken from a study by Schneider and Enste and they have taken the structure of this table from a book by Lippert and Walker which was published in 1997. It shows the categorization of underground economy in terms of illegal and legal activities whereby illegal activities include monetary and non-monetary transactions. Legal activities are done so for the purposes of tax evasion and tax avoidance and can also be monetary and non-monetary.

Source: *Schneider and Enste (2000)*

Since underground economy cannot be directly observed and is estimated through several different techniques, it is hard to state its size with complete precision however most cited estimates on underground economy have revealed that its weighted average size as a percentage of official GDP in Asia is 36.4%. (Friedrich Schneider, Buehn, &

Montenegro, 2010b). This is a relatively high figure and calls out for a look into the factors that are responsible for causing underground economy so that eventually policies can be devised to control these factors and to reduce its size.

1.2 Significance of the Underground Economy

The existence of and an increase in the size of underground economy has given rise to several macroeconomic concerns. Since underground economy is unobserved, the social and economic conditions of individuals cannot be estimated with complete accuracy. If an individual is employed in underground economy, that figure will not be reported in official GDP and it will lead to overestimation of unemployment and underestimation of national income, drastically affecting macroeconomic and public policies. Since underground economy escapes taxes, it lowers tax revenue (Frey & Schneider, 2015) which has negative implications on the quality and provision of public goods and services. Furthermore, repercussions on the distribution of income is another adverse consequence (Gupta & Gupta, 1982). In order to compensate for the loss in tax revenue, governments are forced to raise revenue through tax rates which escalates the likelihood of tax evasion, thereby increasing the size of the underground economy further (Alkhdour, 2011). Hence, an economy gets traps in a vicious cycle which culminates in a weak state and adds to the lack of trust the public develops for the government.

Presence of a large underground economy weakens the monetary policy too since firms operating underground avoid using the banking system. The difficulty of raising funds from banks means that there is a focus on short-term gains only and hence larger-scale, sophisticated investments are neglected. From a microeconomic perspective, a large underground economy also means distorted safety nets for underground economy labor since their health and safety at work is not guaranteed. In addition to this, due to absence of anti-competitive conduct, the economic surplus is likely to be transferred from consumers to equity owners, increasing inequality (Eilat & Zinnes, 2002)

If we narrow down the impact of shadow economy to the sample countries in this study, developing countries like Pakistan are suffering from continuous budget deficits due to loss of tax revenues, owing to its large shadow economy (Aslam, 1999). Similarly in India, substantial resources are allocated to the planning process and biasness in

economic indicators not only mean distortions in policy framework but also a great loss of scarce resources (Gupta & Gupta, 1982).

Despite its drawbacks, underground economy has its benefits. In times of high unemployment levels, especially in developing and transition countries, this sector provides jobs to those who cannot find work in the formal economy (Chowdhury, 2005). Small firms that provide income to the unemployed is likely to have a positive impact on income distribution. This sector maintains economic activity even when there is high corruption and rent-seeking which raises the cost of operating in the official economy. A part of money earned in unofficial economy is likely to be spent in the official economy which will eventually raise tax revenues and formal economic activity. It provides entrepreneurial experience to those who start their own businesses which is likely to have positive implications in the long-run (Eilat & Zinnes, 2002).

However, the problems of underground economy are too many and damaging to neglect and the prolonged existence of the shadow economy would ultimately reduce the overall tax revenue and damage the macroeconomic policy framework hence it is important to look at this issue in detail, identify the root causes that determine its size and growth and devise policies that target those causes, bring most of the underground businesses to formal sector and enable the state and policy framework to become strong and efficient.

1.3 Causes of Underground Economy

According to the bulk of literature on underground economy, its main determinants are taxes, state regulations, institutional quality and bureaucracy (Katsios, 2006; Friedrich Schneider & Neck, 1993; Tunyan, 2005). The higher the marginal tax rate, the greater the benefit of not reporting taxable income (Cebula, 1997). Similarly firms are motivated to operate in the shadow economy since complying with regulations and labor laws means added cost and low profits (Sevgin, 2009).

However, apart from these factors, there are other determinants of underground economy presented in the literature, some of which emerge from the key determinants of the shadow economy mentioned above. Bruno S. Frey and Hannelore Weck (1983) stated tax morality and perception of tax burden to be a cause of underground economy. The

size of underground economy depends on the willingness of people to evade taxes. If there is high tax morality, the size of underground economy will be small. In terms of governance and institutional quality, there are several laws, extent of enforcement of which explains the level of institutional quality. Rule of law and regulatory quality are some of those laws whose proper enforcement means better institutional quality hence a small shadow economy. Regulatory quality is the government's ability to provide sound rules and regulations and acts as an incentive for the private sector to stay in the official economy. Rule of law is the protection of the property rights and ensures the enforcement of contracts. Both regulatory quality and rule of law have a negative relation with the size of underground economy (Sevgin, 2009). Level of education is another determinant of the size of underground economy and does not have a direct link with taxes and quality of institutions mentioned above. High educated labor force means greater selectivity for work in the official economy hence education and the size of underground economy are negatively related (Ela, 2013). Poverty has also been explained as a determinant of underground economy. The impact of poverty on underground economy is felt strongly in developing as opposed to in developed countries (Abiodun & Uffort, 2007). High level of poverty increases the size of the shadow economy since it pushes people to look for work, even underground, in order to make ends meet. The age of firms is also a contributing factor towards shadow economy. Small and young firms are more likely to operate informally (Putniņš & Sauka, 2011). The size of official economy is also a determinant of underground economy. In a booming economy, people are more inclined to work officially and make money however when the economy is in recession, people are more likely to cover their losses by engaging in shadow activities (Buehn & Schneider, 2012). There is also a link between credit markets and underground economy. In this regard, availability of credit along with terms and conditions of lending are significant determinants of the size of underground economy. A negative relationship exists between banking conditions and the size of underground economy (Bose, Capasso, & Wurm, 2012). Energy prices and underground economy are positively related. High energy prices increase costs of firms and they are likely to compensate this by hiding taxes and social payments which means increased size of the shadow economy (Suslov & Ageeva, 2009). Another study established the relationship between internet usage and the size of underground economy and identified a negative correlation between the two. With an increase in GDP, however, that negative correlation is reduced and once GDP

reaches high levels, it can even become positive (Elgin, 2012). A study established a link between unemployment and the underground economy. It was revealed that unemployment and underground economy are strongly related with uni-directional causality running from unemployment to shadow economy. Workers who have little or no chance of working in the official economy are bound to work underground since it is better to work instead of being unemployed and having no income. Hence, with the increase in unemployment, the size of underground economy also increases (Piraee, 2015).

Apart from that, there are numerous other causes of shadow economy, varying across the globe. The focus of this study is to measure the impact of 7 determinants, relevant to the developing countries, on the size of underground economy and the next sections looks at those factors in greater detail with a specific focus on the sample countries of the study.

1.4 Underground Economy in Sample Countries

Underground economy is prevalent in Asian countries mainly Pakistan, Bangladesh, India and Turkey. In Pakistan, underground economy is present in all sectors of the economy be it agriculture, manufacturing or the services sectors (Kemal & Qasim, 2012). The trend of the size of underground economy in Pakistan is varied and its size is highly sensitive to political and economic changes which Pakistan has been experiencing for years now (Aslam, 1999). The size of the underground economy was large and the rate of increase was high in the 1960s and 1980s and it is attributed to high tax rates and regulations imposed by the government (Yasmin & Rauf, 2004). Other causes of underground economy in Pakistan include low tax-GDP ratio, high energy prices, inflation and Pakistan's relationship with her neighboring countries namely India and Afghanistan. Natural disasters like the earthquake in 2005 and floods in the year 2010 have aggravated the severity of shadow economy (Gulzar, Junaid, & Haider, 2010). It is needless to say that the informal sector of the economy in Pakistan has developed more than the formal sector. Efforts made to measure shadow economy have mostly been limited to usage of currency demand approach, MIMIC model and electricity consumption approach (Ram, Ghulam, Sahito, & Qureshi, 2016)

Underground economy is a serious concern in Bangladesh. 80% of the labor force is engaged in the shadow economy while it accounts for 64% of GDP (Raihan, 2010). The causes of a large underground economy include increased economic growth and urbanization, tax evasion and existence of large agriculture sector. Laws and regulations are cumbersome and there is a lack of accountability, transparency and law and order which encourages corruption and smuggling. (Chowdhury, 2005). Underground economy in Bangladesh has mostly been calculated through MIMIC, currency demand approach and computable general equilibrium analysis. (M. K. Hassan, 1997; Raihan, 2010).

The situation of underground economy is no different in India. Studies conducted in India reveal that underground economy has grown from 9.5% of GDP in 1967 to 49% by 1978, owing to high taxes (Gupta & Gupta, 1982). Other studies attributed large shadow economy in India to low literacy levels and government regulations and suggested that shadow economy can be lowered if literacy levels are improved and there is a move away from government coalition to liberalization. Increased growth of newspapers is also likely to lead to cleaner governance (Chaudhuri et al., 2006). In comparison with the rest of the Asian countries, the size of the shadow economy in India is relatively lower (Friedrich Schneider, Chaudhuri, & Chatterjee, 2003) but this sector could still be curtailed in order to speed up its economic development.

Studies conducted on underground economy in Turkey reveal that the size of underground economy is rising but at a decreasing rate. It was calculated to be 31% in 1991 and rose to 35.1% in 2005, owing to high tax burden, unemployment, GDP/capita, lack of enforcement with low probability of detection and inadequate punishments if detected. Lack of trust of population towards public institutions, earlier retirement and lower tax morale have also been identified as determinants of underground economy in Turkey (Davutyan, 2008; Erdinç, 2012; Friedrich Schneider & Savaşan, 2007). The 1980s was a turning point for Turkey's underground economy since structural changes took place which lowered its size (Savasan, 2003). However, the size of Turkey's underground economy is still larger as opposed to other OECD and developed countries which is an indicator for the government to deal with this problem (Yildiz, 2013). Measurement of the size of underground economy in Turkey has been done through several techniques including currency demand approach, MIMIC, kalman filter technique and randomized response models. (Karanfil & Ozkaya, 2007; Savasan, 2003)

These countries are in the process of developing their economies however the existence of underground economy has impacted their macroeconomic policies drastically. The high level of tax evasion and tax losses could deteriorate the pace of development in these countries. Pakistan, Bangladesh and India have shared history and have experienced structural changes which have determined the size of their underground economies. These countries as well as Turkey have faced several economic and financial crises in the past that have made them volatile and have contributed towards their shadow economies. While there is sufficient research available on measuring the size of the underground economies in these countries, there is little information on what leads to the development of underground economy in the first place. Furthermore, bulk of the literature exists on the shadow economy in developed countries but there is a dire need to closely inspect the shadow economies of developing countries because those countries are in need of reforms for their betterment. It is therefore important to look at the factors which cause underground economy in the aforementioned countries and on the basis of the results, policies can then be developed in order to curtail the growth of shadow economy. This study aims to do that.

1.5 Research Question and Objectives

The study aims to diagnose the factors that have an impact on the shadow economies of 4 economically emerging countries in Asia as well as how and why do those factors affect them. This will be done by achieving the following research objectives:

- Identification of the factors that have an impact on the size of underground economy
- Measuring the impact of the identified factors in Bangladesh, India, Pakistan and Turkey
- Conducting a cross-country comparative analysis of the factors affecting the size of underground economy among the aforementioned countries
- Concluding with recommendations that can help reduce the size of underground economy

1.6 Organization of the Study

This study is organized as follows: the second chapter reviews the literature available on the underground economy and its determinants. It explains the link between shadow economy and the seven determinants that are included in this study, how the relationship has developed and changed overtime, the gaps in the literature and finally how this study aims to measure the variables and fill those gaps. The third part provides the research model and the hypotheses tested in this study along with a brief explanation of their development. The forth chapter discusses the research methodology, the variables and their collection in detail and provides the methodology of data analysis. After developing and testing the hypotheses from chapter 3 through OLS regression model and providing descriptive statistics, the findings of the data analysis are discussed in chapter 5. The findings are discussed separately for each country followed by a graphical and descriptive comparative analysis. The final part of the study provides the conclusion in which the research objectives are revisited and linked with the findings of the study, the extent to which they are fulfilled and suggests policy measures in order to curtail the size of the underground economy in the sample countries. The limitations of this study and how future studies can use this research as a base for improvement are also mentioned.

2. LITERATURE REVIEW

2.1 Introduction

This section of the study reviews the literature on underground economy. It comprises the previous studies which have employed the variables that are part of this rsearch. The literature sheds light on how the variables are defined in the previous studies and the impact that they have on the underground economy. The literature begins with an explanation of how shadow economy is measured and later explains the independent variables and their link with the shadow economy and, where applicable, with each other. Keeping everything in perspective, the literature review will eventually identify the gap and how this study aims to fill it.

2.2 Dependent Variable

2.2.1 Underground economy as a dependent variable

There is no widely accepted definition of underground economy in the literature. Underground economy is a wide concept and the literature is mostly confined to discussing a part of the bigger picture. It is also difficult to have a universal definition for this type of economy because it cannot be observed directly. Since the study in question aims to gauge the impact on legal shadow economic activities, the definition most appropriate in this scenario is that of Schneider (2008) who stated that '*shadow economy includes unreported income from the production of legal goods and services, either from monetary or barter transactions, hence, all economic activities which would generally be taxable were they reported to the tax authorities*'. Underground economy goes by several names in the literature namely shadow, hidden, informal, subterranean, parallel, unofficial and unreported. Since the name hidden economy implies that this type of economy is hidden from the formal records, it is difficult to measure it via direct methods therefore most of the methods of measuring underground economy are indirect (Jamalmanesh, 2011). Indirect approaches of measuring shadow economy use indicators to gauge its development overtime. These include discrepancy between national income and expenditure statistics, discrepancy between official and actual labor force, transactions approach, the currency demand approach, physical input (electricity consumption method) and the model approach referred to as the multiple indicators,

multiple causes model (MIMIC). All these approaches of measuring shadow economies have their benefits and criticisms but their availability shows that shadow economies are difficult but not impossible to measure (Friedrich Schneider & Enste, 2000).

Bulk of the literature on underground economy has treated it as dependent variable and has employed indirect approaches to measure its size. The most common methods of measuring shadow economy in the literature are currency demand approach, MIMIC, DYMIMIC and physical input method. This study uses estimates of shadow economy calculated using MIMIC from Schneider and Hassan (2016a). This is because not only the MIMIC estimates provided in this study are widely used and authentic, usage of large panel data sets has provided shadow economy estimates for the countries for the time period included in this study. The idea of MIMIC is to represent the unobserved underground economy as a latent variable which has observable causes and effects. Thus, MIMIC model connects two types of observed variables with one unobserved variable (Breusch, 2005).

While many studies on underground economy have provided methods of measuring it, there are several studies that have used authentic measures of shadow economies from other studies. A study conducted for 69 countries used estimates for OECD countries and United States from Schneider (1997). For Africa and Asia, estimates from Schneider and Enste (1998) were used (E. Friedman, Johnson, Kaufmann, & Zoido-Lobaton, 2000). Another study by Michael Krakowski (2005) used shadow economy estimates from Schneider (2002) and analyzed the determinants of shadow economy using cross country regressions. A sample of 109 countries was employed in this study. Mustafa Sevgin (2009) used shadow economy estimates from Schneider (2004b) with the aim of testing the impact of taxes and regulation on underground economy for 133 countries from 2003 to 2005. The study concluded that tax burden increases while regulatory burden reduces the size of underground economy. Saibal Kar and Shrabani Saha (2012) used Schneider (2007) in their study that investigated the relationship between informal economy, income inequality and corruption for 19 countries in Asia from 1995-2008. The same estimates were used to examine the relationship between the banking sector and the size of underground economy for 137 countries from 1995-2007. The findings of the study revealed that both the depth and efficiency of banking sector have an impact on the underground economy. An improvement in the banking sector

therefore leads to a reduction in the size of the shadow economy (Bose et al., 2012). Schneider (2007) along with Schneider (2005) were used by Roberto Dell Anno (2008) who analyzed the relationship between official and unofficial economies for Latin American countries and empirical analysis for the countries revealed that official and unofficial sectors are complements rather than substitutes. Schneider (2005) was also used in another study that examined the relationship between shadow economy and state regulation on a macro level across a broad set of countries. The study concluded that different countries have different regulatory environments which leads to varying levels of underground economies. The lower the state regulation along with better law enforcement, the smaller will be the size of the shadow economy (Kus, 2010). Another study used Schneider (2010a) to gauge whether allocating more public resources to education will reduce the size of the shadow economy using a cross-section of 70 countries. The results of the study indicated that there is a negative relationship between education and the size of the shadow economy (Berrittella, 2015). Same measures for informal economy were also used in another study that highlighted the political determinants of underground economy and measured the impact of political instability, political polarization and various political indicators on it. The study also stated that structural shift from autocracy to democracy could lead to an increase in informal economy if it gives rise to political instability (Elbahnasawy, Ellis, & Adom, 2016). Ceyhun Elgin and Mario-Solis Garcia (2012) also used Schneider (2010b) to argue that high taxes are not the main drivers of shadow economy rather it is the trust of producers in government that determines its size. They used panel data to empirically test their claim and it was in line with their theory. Rajeev K. Goel and Michael A. Nelson (2016) also used the same measures for shadow economy along with Schneider (2012) to identify the robust determinants of informal economy and to address related modeling uncertainty. This study used three different types of shadow economy measures and concluded that bureaucratic and tax complexity as opposed to monetary severity are its major drivers. It also identified that shadow economies differ among developed and developing countries in terms of their determinants. A different study by Schneider (2010) was used to assess the importance of factors which have an impact on shadow economy for 19 OECD countries from 2003-2008. In accordance with the factors that are strong drivers of shadow economy namely taxes, regulatory framework and governance, the study

concluded by evaluating the possible gain that Greece can obtain in order to reduce its shadow economy (Manolas, Rontos, Sfakianakis, & Vavouras, 2013).

It can be analyzed from the reviewed literature that shadow economy in numerous studies is defined using Schneider's estimates. On the basis of literature, it can be generalized that these estimates are authentic and are provided for a large sample of countries over a long time span. Most of the studies reviewed have made use of estimates from 2005, 2007, 2010 and 2012 but most recent estimates are yet to be used. This study aims to use the newest estimates of shadow economy provided by Schneider (2016b). This will be an addition to the literature since the most recent (2000-2013) measures of shadow economy will be employed. Shadow economy is estimated via MIMIC and main drivers of shadow economy have been taxes, regulatory burden, unemployment and self-employment. Most of these determinants are also used in the study in question and their discussion is provided in the next section of literature review.

2.3 Independent Variables

2.3.1 Tax

According to OECD (OECD, 2016a), tax is defined as a '*compulsory unrequited payment to the government*'.

In theoretical terms, taxes and shadow economies have a positive relationship. High taxes affect labor-leisure choices and labor is motivated to move underground which is untaxed. High tax rates also mean reduced after tax earnings and profits for employees and employers respectively which motivates them to operate in the shadow economy (Siddiki, 2014).

This section will review the literature on tax in the sample countries for this study namely Pakistan, India, Bangladesh and Turkey. It will explain how tax has been defined in the previous studies and how it determines the size of underground economy. This section will conclude with how tax is defined in the study in question and the reasons for defining it as such.

Mehnaz Ahmed and Qazi Masood Ahmed (1995) used monetary approach to estimate the size of underground economy in Pakistan. Ratio of total tax revenue to GDP

has been used in the model to estimate the size of underground economy. The sign between currency demand and ratio of tax revenue to GDP is hypothesized to be positive since high taxes are likely to increase tax evasion which is carried out through currency usage. The hypothesized sign has been verified by the model to be true. Another study conducted to measure shadow economy of Bangladesh also used currency demand approach. Three types of taxes have been used in this study namely average tax rates on imports, exports and domestic economic activities. Taxes on economic activities include income and corporate taxes, excise duties, sales taxes and other taxes. Import taxes include import duties and sales taxes on imports and taxes on exports include export duties. All taxes have positive sign which means rise in taxes increase the underground economic activities hence increase in currency demand. The actual results are in line with the hypothesis (M. K. Hassan, 1997). In their study, Ferda Halicioglu (1999) used currency demand approach to measure the size of the shadow economy in Turkey and highlighted that increased tax burden is likely to increase the size of shadow economy given that some tax reforms were being implemented by the Turkish government when this study was conducted. Tax in this study is the total amount of direct and indirect taxes to GNP. Another study on estimating the size of Turkish shadow economy used randomized response and MIMIC techniques using data from 1971-1998. The model used direct, indirect and social security tax revenues as percentages of official GDP. The results showed that all taxes have a positive relationship with the size of underground economy, with direct taxes having the greatest impact (Savasan, 2003). Tax burden was measured in another study by using direct and indirect tax rates. Tax burden was categorized into household and business. The study concluded that tax burden has a positive impact on the size of the underground economy (% of official GDP) in Asian countries (Friedrich Schneider & Bajada, 2003). Another study estimated underground economy of India using MIMIC from 1960-1998. Taxes were treated as a causal variable in the model and were defined as ratio of total corporate taxes to nominal GDP, ratio of total direct taxes to nominal GDP, ratio of total indirect taxes to nominal GDP and the first difference of the ratio of total indirect taxes to nominal GDP. The results showed that both direct and indirect taxes have a positive impact on the size of underground economy in India (Friedrich Schneider et al., 2003). Another study on shadow economy was conducted for 145 countries using DYMIMIC and currency demand approaches over the period 1999-2003. It employed tax burden using actual and perceived direct and indirect taxes and

concluded that high tax burden increases the size of the shadow economy (Friedrich Schneider, 2004a). A study on underground economy of Bangladesh defined marginal tax rates (MTR) as income and corporate taxes. It stated that '*higher tax rates interfere with the ability of individuals to pursue their goals in the marketplace, which means that with a higher fiscal burden, informality grows in an economy*.' This means that high tax burden is associated with a large underground economy. The results of this study revealed that MTR has a positive and significant impact on the size of informal economy in Bangladesh (Chowdhury, 2005). In their study on measuring the size of informal economy in Pakistan (2010), the authors used currency demand approach to measure the size of the underground economy. Model developed in this study used ratio of total taxes to nominal GDP. The study concluded that although tax is an important determinant of shadow economy, lack of education drives people to work in the shadow economy. Another study on Pakistan's shadow economy used several approaches to measure its size and identified its determinants. Tax in this study was also defined as ratio of overall tax to GDP and identified it as one of the prime causes of the underground economy in Pakistan (Gulzar et al., 2010). A study on measuring hidden economy of India used MIMIC model in which direct and indirect taxes were employed as causal variables. Ratio of total corporate taxes to nominal GDP, ratio of total direct taxes to nominal GDP and ratio of total indirect taxes to nominal GDP were used in the model. The results of the study showed that all types of taxes have a positive impact on the size of the underground economy and thus endorses the existing literature (Friedrich Schneider, 2011). Another study used currency demand approach to measure the size of shadow economy for 111 developed and developing countries. Since the bulk of the work is done for developed countries, the contribution of the study is its measurement of the size of the shadow economy for developing countries. Tax burden in this study is defined as total tax revenues as a percentage of GDP. The study also introduced a new enforcement variable measured by quality of bureaucracy and rule of law. The study has concluded by linking tax and enforcement and has stated that high tax rates with weak enforcement is what drives shadow economies. Taxes cannot be looked at in isolation rather their effect on shadow economy is determined by the level of enforcement in place (Alm, 2013). A study on Bangladesh's shadow economy used currency demand approach to measure its size from 1973-2008. Tax in this model was measured using tax-GDP ratio using nominal GDP at current price and tax revenue mobilized in the whole economy in the specific

fiscal year. The overall results of the study showed that tax is a significant determinant of the size of the underground economy in Bangladesh (Haque, 2013). A detailed study on the shadow economy of Turkey highlighted that its tax laws are difficult to understand and implement. In addition to this, tax auditing lacks efficiency and gives informal players an opportunity to operate underground freely since they are less likely to get caught. Tax in this study is defined as average tax rate measured as a percentage of GDP. The study concluded that initially the model provided a negative relation between tax and the underground economy but it gave a positive relation in other versions. Overall, there exists a positive relation between tax and the shadow economy in Turkey and problems exist with regards to the tax laws in the country (Yildiz, 2013). A study on Pakistan used currency demand approach to measure the size of its shadow economy from 1975-2010. Tax in this study was defined as tax revenues as a ratio of consolidated revenues. The results of the study revealed that increase in taxes motivate people to engage in tax evasion which is facilitated by increased usage of currency hence a positive relationship is seen between taxes and currency demand (Kiani, Ahmed, & Zaman, 2014). Another study estimated the size of Bangladesh's underground economy using MIMIC from 1975-2010. Taxes have a significant impact on the size of underground economy in Bangladesh. This study used total tax revenues as a percentage of GDP. The results of the study showed that taxes and shadow economy share a positive and significant relationship hence an increase in taxes will increase the size of underground economy in Bangladesh (Siddiki, 2014). The fact that taxes have a huge impact on the shadow economies of developing countries and Bangladesh in particular was endorsed by another study that highlighted that high taxes increase the benefits of staying underground. The rate of corporate tax as a percentage of profit in Bangladesh is 32.5% and personal income tax is around 10 to 25 percent. This, coupled with weak rule of law and regulatory framework has given rise to the shadow economies in developing countries (H. Hassan, 2016). Another study by Friedrich Schneider and Hassan Mai (2016b) was the first attempt to measure shadow economy for 157 countries from 1999-2013 using MIMIC and highlighted that high tax burden is one of the major drivers of the underground economy. Tax burden in this study has been measured by tax revenues as a percentage of GDP. The study has also explained that Tax and institutional factors go hand in hand and in countries where tax base is large, shadow economies tend to be smaller which is due to the good institutional framework in those countries.

Keeping the literature review in perspective, it can be seen that tax is indeed a significant determinant of shadow economy across the globe and no study can neglect this variable. While previous studies have mostly made use of tax rates, the study in question will measure taxes using tax revenue as a percentage of GDP to present a new aspect of taxes and see how this measure of tax affects the size of shadow economy.

2.3.2 Inflation

Inflation is a broad economic concept and refers to a considerable and persistent rise in the general price level of commodities over a long period of time (Dwivedi, 2007).

This section will review the literature on the way inflation has been defined in previous studies and its relationship with the underground economy in Pakistan, India, Turkey and Bangladesh. The section will conclude with how inflation is defined in the study in question along with the reasons for doing so.

According to the literature, both negative and positive relationship is observed between underground economy and inflation rate. When prices rise, the fall in real income prompts people to work in the official economy. At the same time, falling real incomes and lack of opportunities in the official economy also leads people to work in the shadow economy. The decision to operate in the shadow economy depends on other factors like tax morality, culture and expectations about the future price levels (Friedrich Schneider et al., 2003).

In a study conducted on shadow economy in India and in 18 Asian countries from 1960-1978, the authors used MIMIC model where inflation was one of the causal factors. Inflation in this study was defined as the log of the ratio of current year's consumer price index (CPI) to previous year's CPI. The results of this study revealed that there exists a negative and significant relationship between inflation and the size of the shadow economy in India (Friedrich Schneider et al., 2003). In a study on the shadow economy of Pakistan, inflation rate was calculated as growth rate of CPI in percentage. The study concluded that inflation is a significant determinant of the size of informal economy although the direction of relationship is not discussed in the study (Gulzar et al., 2010). A study on underground economy in Turkey highlighted inflation as its primary driver. It

has stated that high inflation rates have been partially responsible for economic instability in Turkey (Erdinç, 2016)

It can be extracted from the literature above that little work has been done on explaining the relationship between inflation and shadow economy in Pakistan, Turkey, India and Bangladesh. There are several studies which have not clearly specified the direction of the relationship between shadow economy and inflation. Hence the study in question aims to look at the relationship between shadow economy and inflation in the aforementioned countries in greater detail and identify the direction of the relationship with more clarity. The study in question will use CPI from 2000-2013 to measure inflation. Inflation measured using CPI reflects the change in cost of a basket of goods and services to an average consumer over a specific period of time.

2.3.3 Unemployment

According to OECD (2016b), '*unemployed people are those who report that they are without work, that they are available for work and that they have taken active steps to find work in the last four weeks*'.

This section will review the literature explaining the relationship between unemployment and the size of shadow economy in Pakistan, India, Turkey and Bangladesh. The section will conclude by identifying the gaps in the literature, how this study defines unemployment and the reasons for doing so.

There exists a debate on the relationship between unemployment and the size of shadow economy. According to Giles (1999), high unemployment and shadow economy are likely to be positively related since high unemployment in official economy will force people to operate in the informal economy while there could also be a negative relationship between the two since economic downturn would mean that unemployment exists in both official and unofficial economies.

In a study on measuring underground economy in Turkey using MIMIC from 1970-1998, unemployment was used as a determinant in the model and was defined as unemployment rate. The study concluded that there exists positive and significant relation between unemployment rate and the size of shadow economy (Savasan, 2003). Another study used unemployment to explain the state of the economy. The worse the state of the

economy, the higher is the shadow economy meaning the higher is the unemployment, the larger is the size of the shadow economy. The study concluded that the unemployment variable is significant and has a positive relation with the size of the underground economy (Kanniainen, Pääkkönen, & Schneider, 2004). In another study conducted to measure the informal economy of Pakistan using multiple approaches, unemployment rate was employed as a causal variable in estimating the size of the shadow economy using MIMIC. The results revealed that unemployment has positive however insignificant impact on the shadow economy of Pakistan (Gulzar et al., 2010). A primary research established the hypothesis of a positive and significant relation between unemployment and the tendency to perform in the shadow economy. Using logit model, the results of the study revealed the existence of a positive and significant relation between underground economy and unemployment rate (FiroozAbadi, Razmi, & Bahmani, 2015). In a study by Friedrich Schneider and Hassan Mai (2016b), it was also hypothesized that unemployment and shadow economy have a positive relationship despite its ambiguities. Unemployment rate, measured by total unemployment as a percentage of labor force, was used as a causal variable in measuring shadow economy in 157 countries using MIMIC. The study has also identified unemployment to be a driver of smuggling, do-it-yourself activities (DIY) and neighbors' help which has resulted in slightly higher value for unemployment. The results of the study revealed a positive relationship between unemployment and the shadow economy and identified its impact as significant. A study on Turkish underground economy established the link between level of education and unemployment and conducted a causality analysis from 2000-2011 using structural vector auto regression approach. The results of the study revealed that bi-directional granger causality from unemployment people who have graduated high and vocational high school to shadow economy exists since people who are working in official economy are also likely to be engaged in underground economy. Bi-directional granger causality from shadow economy to unemployed people who are not literate exists. This means that people who are not literate are more likely to engage in shadow economy and an increase in shadow economy is likely to reduce the level of unemployment in this case (Sarac, 2012). Another study tested the relationship between unemployment and shadow economies for 32 developing and developed countries from 1980-2009 using parametric and non-parametric techniques. The study highlighted that substantial heterogeneity exists across developing and developed countries due to which different types of

relationships are observed between unemployment and shadow economies. Unemployment has been measured by using unemployment rates. According to this study, neutral relationship was seen between unemployment and shadow economy in Pakistan whereas in other countries, uni-directional and bi-directional relationships were seen. The study also stated that there are other factors which are specific to the country namely tax burden, quality of institutions and the level of economic development which leads to divergence of results (Saafi, Farhat, & Haj Mohamed, 2015).

It can be analyzed from the literature review above that there are few studies that explain the relationship between unemployment and shadow economy in India and Bangladesh. Studies conducted for Turkey and Pakistan have shown the existence of a positive relation however, there are still some ambiguities present, especially in Pakistan. Keeping these gaps in perspective, the study in question aims to use total unemployment (% of total labor force) and measure its impact on the size of the shadow economy for Pakistan, India, Turkey and Bangladesh from 2000-2013. Unemployment in this context refers to those who are without work but are available and looking for a job.

2.3.4 Index of economic freedom

According to World Economic Forum (2016), '*institutions are defined by two characteristics that reflect core features put forward by economic literature. First, institutions set formal, legally binding constraints such as rules, laws, and constitutions along with their associated enforcement mechanisms. Second, institutions include informal constraints such as norms of behavior, conventions, and self-imposed codes of conduct such as business ethics, and can be thought to include norms of corporate governance as well*'. The quality of institutions refers to the quality of law enforcement, property rights, rule of law, corruption perception and the like (International Monetary Fund, 2004). A study has defined governance as '*the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected and replaced, the capacity of the government to formulate and implement sound policies, and the respect of citizens and the state for the institutions that govern economic and social interactions among them*' (Kaufmann, Kraay, & Mastruzzi, 2004).

This section will review the literature on the relationship between institutional quality/governance indices/index of economic freedom and the size of underground

economy in Pakistan, Turkey, India and Bangladesh. It will explain how institutional quality has been measured in previous studies and how the study in question aims to measure it and the reasons for doing so.

Institutional quality and government regulations are widely discussed in the literature and there are numerous ways to measure them. Institutional quality has a negative relation with the shadow economy while high regulations tend to push up the business costs and force them to go underground.

This study will include indices for property rights, freedom from corruption, fiscal freedom, government spending, business freedom, trade freedom, investment freedom and financial freedom and test their impact on the size of underground economy. The average of all these indices has been taken to arrive at one overall index referred to as governance indicator/index of economic freedom in this study. A brief description of the indices has been provided.

According to Heritage Foundation (2017a), '*business freedom is an overall indicator of the efficiency of government regulation of business'*. The scores of this index are obtained from an array of measurements related to difficulty in starting, operating and closing a business. There are equally weighted factors comprising this index.

Financial freedom is an index that indicates banking efficiency as well as measures independence from government control and interference in the financial sector. Like business freedom index, this index is also made up of several factors on the basis of which scores are derived (Heritage Foundation, 2017b).

Property rights index assesses the ability of individuals to accumulate private property, secured by clear laws that are fully enforced by the state. It also measures the extent to which a country's law protect private property and how well those laws are implemented. Furthermore, it also takes into account the likelihood of expropriation of property and analyzes the independence of judiciary, the level of corruption within judiciary and the ability of businesses and individuals to enforce contracts (Heritage Foundation, 2017g).

Corruption erodes economic freedom by bringing in insecurity and uncertainty. It damages the integrity of the government and distorts economic relationships. Freedom

from corruption index measures how well the country has protected itself from corruption (Heritage Foundation, 2017d).

Investment freedom measures the freedom of individuals and firms in terms of moving their resources freely into and out of specific activities both within the country and internationally. There is no restriction on movement of investment capital when a country attains complete investment freedom (Heritage Foundation, 2017f).

Fiscal freedom, according to Heritage Foundation (2017c), comprises three quantitative factors namely the top marginal tax rate on individual and corporate income and the total tax burden as a percentage of GDP. A quadratic cost function is used to calculate this index whereby the function represents the diminishing revenue returns from high rates of taxation.

Government spending refers to the level of government expenditure as a percentage of GDP. This includes government expenditure, including consumption and transfers for the entire score. There is no optimal level of government spending rather it varies from country to country however situations of chronic budget deficits and accumulation of sovereign debt are not favorable. This index has a score from 0 to 100 whereby scores closer to 0 mean less government spending (Heritage Foundation, 2017e)

Trade freedom is a composite measure of the absence of tariff and non-tariff barriers that affect import and export of goods and services. It is based on two inputs namely trade-weighted average tariff rate and non-tariff barriers (NTBs). Trade-weighted average tariff rate is a purely quantitative measure while NTBs in a country are determined using qualitative and quantitative information (Heritage Foundation, 2017h)

All the indices are from 0-100, 100 being the best. Freedom from corruption, however, ranges from 0-10 whereby 0 means extreme corruption and 10 means minimum corruption.

A study conducted for measuring shadow economies in the world highlighted that regulations are often measured by number of laws and regulations namely license requirements which reduces the freedom of individuals in the official economy and increases their costs. This pushes them to operate in the unofficial economy where these costs can be avoided. The focus should be more on the proper enforcement of regulations

and not on increasing their number if the size of underground economy needs to be reduced (Enste & Schneider, 1998). Another study used expert ratings on freedom indices from various sources namely Heritage Foundation, Fraser Institute, Freedom House and Political Risk Services. Economic freedom, freedom from corruption and indices related to property rights were used in the study. Economic freedom index is a diverse index that measures freedom of business to operate effectively. These indices are developed by collecting first hand data from the businesses through a comprehensive process. The study has concluded that more corruption leads to a high level of underground economy and the relationship is strong across most of the sample countries. The study also concludes that more shadow economy further weakens the government's ability to keep law and order and to protect property rights. It is also important for the state to understand the difference between regulation and over regulation. While regulation with regards to health and safety contributes towards productivity, over regulation can undermine the impact and will instead increase business costs, moving them to operate informally (E. Friedman et al., 2000). A study conducted for the shadow economy of Bangladesh mentioned business freedom and freedom from corruption as determinants of underground economy. Business freedom was defined in the study as the '*ability to create, operate, and close an enterprise quickly and easily*'. The more regulation there is in place, the higher is the size of the shadow economy. Freedom from corruption assesses the level of corruption in the business environment and the levels of government legal, judicial and administrative corruption. There exists a positive relationship between corruption and the size of shadow economy (Chowdhury, 2005). Another detailed study on corruption, shadow economy and government regulation was conducted for low and high income countries whereby it was hypothesized that high regulation increases both the shadow economic activities and corruption. Regulation in this study was measured using seven measures from The Heritage Foundation and the Fraser Institute. The results of the study were in accordance with the hypothesis i.e. high regulations lead to expansion of the shadow economy. Corruption in this study has been treated as a dependent variable and is measured using a corruption index from ICRG. The results have revealed that corruption and shadow economy are complements in low income countries and substitutes in high income countries. In some cases, no significant impact of corruption on shadow economy is seen (Dreher & Schneider, 2006). Another study also used data on institutional quality from International Country Risk Guide and used an average of institutional dimensions namely

government stability, rule of law, corruption, democratic accountability and bureaucracy quality. The results of the study have been in harmony with the hypothesis which means that institutional quality is negatively and significantly related with the size of the shadow economy regardless of the method by which shadow economy is measured (Chong & Gradstein, 2007). Another study that measured the relationship between shadow economy and poverty via its impact on governance and economic growth used government effectiveness, regulatory quality, control of corruption, voice and accountability and political stability and lack of violence. The results of the study indicated that in developing countries, increasing shadow economy leads to increased poverty when high value of government size is considered while in developed countries, shadow economy decreases poverty when low value of government is considered (Nikopour, 2010). A study was conducted for 34 countries and developed a negative relation between institutional quality and shadow economy. It stated that good institutions not only increased formal GDP but lowered informal GDP in developed and developing countries. The governance indices included in this study were rule of law, government effectiveness, property rights, political stability, fiscal freedom, control of corruption, regulatory quality, growth rate of labor force and voice and accountability. The results indicated that improved political systems lower shadow economy in Asian countries along with simplification of laws and control of corruption (Razmi & Jamalmanesh, 2014). In their study, Ceyhun Elgin and Oğuz Öztunalı (2014) hypothesized that high GDP/capita leads to large shadow economy in countries with low institutional quality. Determinants of shadow economy cannot completely be looked at in isolation. Institutional quality in this study was measured using corruption control, law and order, bureaucratic quality, government effectiveness and regulatory quality indices. The results of the study have shown that high GDP/capita leads to large shadow economy in countries where institutional quality is low and small shadow economies where it is high. When the impact of GDP/capita is controlled, institutional quality has a negative and significant relationship with the size of the shadow economy. Institutional quality has also been linked with taxation whereby countries with large tax base have small shadow economies due to high institutional quality. It is expected that good rule of law, enabling businesses to start a new business freely and giving them secure property rights encourages them to stay in the official sector and increases cost of going underground. On the contrary, corruption and bureaucracy acts as a hassle for businesses thereby forcing them to operate

informally. Institutional quality is measured by economic freedom and business freedom indices. The higher these indices are, the smaller will be the shadow economy ceteris paribus. The results of the study showed that across the globe, institutional quality is one of the main drivers of shadow economy (M. Hassan & Schneider, 2016b). A study conducted for the shadow economy of Bangladesh identified corruption as one of the major contributing factors towards shadow economy. Corruption gives rise to bureaucracy and firms remain informal in order to avoid it. It is one of the main problems for doing business in Bangladesh and is a significant explanatory factor for its large underground economy (H. Hassan, 2016). A comprehensive study on the relationship between institutional quality and the shadow economy used fiscal freedom, control of corruption, property rights, business freedom and financial freedom indices to gauge their impact on the size of shadow economy. The study revealed that high fiscal freedom extends shadow economy while control of corruption reduces it. Financial and business freedom also limit the size of the shadow economy and are significant variables. Property rights also have a similar impact. These results are true for Asian and developing countries (Jamalmanesh, 2011). Another study hypothesized a negative relation between governance and the shadow economy using control of corruption index and by controlling the influence of employment rate and growth of GDP. The results of the study were in harmony with the hypothesis (B. A. Friedman, 2014).

Keeping the above literature in perspective, it can be seen that institutional quality and governance is one of the pivotal determinants of the size of shadow economy. The studies conducted previously have established a negative relationship between institutional quality and the shadow economy which means that high institutional quality reduces the size of the shadow economy. There are numerous ways of measuring institutional quality and different types of indices have been used throughout the literature. This study aims to measure institutional quality using indices for property rights, freedom from corruption, business freedom, investment freedom, trade freedom, fiscal freedom, government spending and financial freedom because they are important for the sample developing countries in this study and are significant to the growth of their shadow economies. Furthermore, corruption is one of the prime problems in these countries hence freedom from corruption index is pivotal. This determinant, like taxes, cannot be ignored in any study that involves shadow economy.

2.3.5 GDP

According to IMF (2012), GDP refers to the final monetary value of goods and services produced within the borders of a country over a specific period of time.

This section aims to review the literature on the relationship between annual GDP growth (%) and the size of the underground economy in Pakistan, Turkey, India and Bangladesh. It will explain how GDP has been measured in previous studies and conclude by defining GDP in the study in question as well as the reasons for doing so.

In a study conducted on shadow economies around the world, GDP was treated as a dependent variable and shadow economy was one of the independent variables. It was seen that shadow economy and GDP have a significant and negative relationship in developing countries while a positive and significant relationship was seen in developed countries. GDP in this study was defined as official growth in annual GDP per capita (Klinglmair & Schneider, 2004). In another study on measuring underground economy in Turkey using currency demand approach, real GDP/capita was used as an independent variable in the regression model. The results of the study revealed that there exists a positive relationship between real GDP/capita and underground economy in Turkey (Yildiz, 2013). In another study conducted for 141 countries, GDP per capita was used as a proxy for economic development. The results of the study revealed that countries with large shadow economies despite high GDP/capita levels have low institutional quality and vice versa. Thus, institutional quality has a huge role to play in terms of explaining the relationship between GDP and underground economies. GDP cannot be looked at in isolation (Elgin & Oztunali, 2014).

Keeping the above literature review in perspective, it can be seen that bulk of the studies have focused on Turkish underground economy and have presented a general overview of the relationship between GDP/capita and shadow economy. However, there is a dearth of studies for Pakistan, India and Bangladesh that could explain this relationship with greater clarity. So far, the relationship established by the literature is ambiguous and keeping this ambiguity in perspective, the study in question aims to test the relationship between GDP growth and the shadow economy for the sample countries from 2000-2013. This growth rate is for GDP at market prices based on constant local currency.

2.3.6 Internet users

According to World Bank (2016a), internet users are defined as individuals who have used internet from any location in the last 12 months via any gadget. This section will review the literature on internet users and its impact on underground economy in sample countries analyzed in previous studies. The section will then conclude with how it is defined in the study in question and the reasons for doing so.

A study on internet and corruption identified greater corruption awareness as a deterrent of corruption and highlighted the pivotal role that internet plays in disseminating information about corruption to masses. The study used a sample of 150 countries and using OLS, established a negative relation between internet hits and corruption (Goel, Nelson, & Naretta, 2012)

Ceyhun Elgin (2012) in his study posed a research question as to whether the spread of internet aids or curtails the growth of shadow economy. For this purpose, a panel data of 150 countries over 9 years from 1999 to 2007 was used to examine the empirical relationship between internet and the size of shadow economy. The results of the study revealed that relationship between internet and shadow economy is strongly influence by GDP/capita. Although there is a negative relationship between internet usage and shadow economy, once GDP/capita starts increasing, this negative correlation is reduced and it could even become positive if GDP/capita increases further. The study also indicated that this relationship varies from developing to developed countries due to varying GDP/capita levels. Internet has been defined in this study by using internet users per capita.

Another study highlighted the complementarity between internet adoption and e-government to curb corruption. While other studies revealed a negative relationship between internet and corruption, this study showed an ambiguous relationship between the two and concluded that a bilateral causality exists between internet usage and corruption (Elbahnasawy, 2014).

Another study used internet users as a sub-index for information and communications technology (ICT) and used secondary data for 98 countries, including Turkey, Pakistan and India, to develop a relationship between ICT, corruption and other

control variables. The results of multiple regression used in this study revealed that a negative relation exists between ICT and corruption (Shrivastava & Bhattacherjee, 2014).

Keeping in view the literature review above, it can be analyzed that although internet users have an impact on shadow economy and corruption, most of the previous studies have used it as a sub-index which means that specific impact of internet users has been unexplored to date. Furthermore, while there are studies which have discussed the relationship between corruption and internet users, there is an overall dearth of studies on the relationship between internet users and shadow economy. In addition to this, most of the studies have used large data sets and the focus on developing countries in particular is still less explored. This study aims to fill all the above mentioned gaps in the literature by using internet users (per 100 users) as an independent variable and will gauge its impact on shadow economy for the sample countries from 2000-2013. The impact of internet users will be seen in isolation.

2.3.7 Population growth

Population growth refers to the exponential growth rate of mean population from t-1 to t year, expressed in terms of percentage. All citizens regardless of legal status or citizenship are included in this measure (The World Bank, 2016b).

According to the literature, there is no direct and clear link between population growth and shadow economy however it affects the level of corruption in developing countries. Most of the studies have established that shadow economy and corruption in developing countries are complements (Choi & Thum, 2005; Daniel Kaufmann &, 1998; Dreher, Schneider, Choice, & July, 2010) and the sample countries in our study have high corruption levels which has contributed towards their large underground economies. Since one of the factors leading towards corruption is population, particularly in developing countries, an indirect and positive link between shadow economies and population growth via corruption can be established for this study. This study has used population growth as an independent variable to determine the size of shadow economy since population growth is a pivotal factor for developing as opposed to developed countries. Consequently this relationship could be explored. Apart from determining the size of shadow economy through the channel of corruption, a high population growth, especially for developing countries, means more mouths to feed with limited resources

and in such cases, people are forced to move underground since it offers them an income source. This puts an upward pressure on the size of shadow economy.

Keeping the gaps in the literature and to explore this variable for developing countries, this study aims to use population growth measured as a percentage to gauge its impact on the shadow economy of sample countries from 2000-2013.

2.4 Conclusion

This section of the study has presented an analysis of the previous studies undertaken on shadow economies in the world and has particularly focused on the sample countries namely Pakistan, India, Turkey and Bangladesh. It has identified the level of shadow economies in these countries along with the ways of measuring it. Furthermore, the literature review has provided the main determinants of shadow economy which are a part of this study and has discussed their relationship with it. It has presented the theoretical and empirical analyses of previous studies, the differences and similarities among them, the reasons for the kind of relationships between underground economy and its determinants, the development in literature overtime, the interconnectedness of independent variables and the extent of the significance of independent variables in determining the size of shadow economy. Side by side, the literature review has also provided the way variables are measured previously and how the study in question aims to measure them as well as the reasons for doing so. The literature review has also identified the gaps for each variable and has explained the prospective contribution of this study towards filling those gaps.

On average, almost 33% of the economies in Asia are engaged in the informal sector (M. Hassan & Schneider, 2016b). The study in question aims to take a closer look at the emerging economies in Asia where shadow economy is a cause of concern since the size of shadow economies in India, Pakistan, Bangladesh and Turkey on average is 21.76%, 31.43%, 38.83% and 37.33% respectively (M. Hassan & Schneider, 2016b). These countries are developing and given that the bulk of literature has focused on the underground economies in developed countries, more research needs to be conducted for the developing countries that are in dire need of better reforms and policy framework. From the developing countries that are part of this study, it has been observed that less research has been conducted for Indian shadow economy hence this study is likely to add

to the literature in this regard. Most of the studies have measured the size of shadow economies and while causes of shadow economies have been identified, there is a greater need for developing models that test the theory. This study aims to do that.

With regards to the determinants of shadow economy, bulk of the literature has discussed taxes, governance and institutional framework as main causes of the shadow economy. The study in question aims to include all of them. Index of economic freedom is measured as it has been in previous studies. Taxes are measured using tax revenue which is a slightly different measure from the literature since most of the previous studies have used tax rates to measure taxes. Tax revenue is used due to absence of data on tax rates for the sample countries as well as to bring the problem of weak tax structure and narrow tax base in the limelight. There are numerous other causes of shadow economy that the literature has provided but they need further investigation. It has been observed that causes like inflation and population growth are much more prevalent in developing countries in contributing towards shadow economy as opposed to in developed countries. Population in developing countries is much higher than in developed countries and people seek an income source in the underground economy. These determinants need closer inspection since most of the literature is focused on developed countries' shadow economy. Consequently, the study in question aims to use population growth as a determinant of shadow economy and will gauge its impact for the sample countries. It has been extracted from the literature that the relation between shadow economy and unemployment is ambiguous since both negative and positive relation exists between the two. In order to investigate this relation further, the study in question also aims to use unemployment (as a percentage of labor force) as a determinant of shadow economy. Another ambiguous relationship established by the literature is the one between GDP growth and shadow economy. Less work has been done with regards to test this relationship. Consequently this study aims to put this relationship to test in a different time frame, using a different measure of GDP and on a different sample of countries to see whether similar or different results will be obtained. Inflation is included in the study since it is a pivotal determinant of the size of shadow economy in developing countries and requires detailed investigation. With regards to the inclusion of internet users, it has been observed that less work has been done in terms of investigating the relationship between internet users and shadow economy in the developing countries. With the

advancement in technology and increasing use of ICT, this variable has gained importance for both developed and developing countries alike. Hence, its impact needs to be tested on the size of shadow economy.

The final aim of the study is to provide some recommendations which can act as a base for the sample countries and can enable them to lower the size of their shadow economies. This will be the contribution of this study towards the existing literature on shadow economy.

3. RESEARCH MODEL

Figure 3.1 below shows the research model which is a diagrammatic illustration of the research before shaping it into an econometric form. It shows all the independent variables and their hypothesized relationships with the dependent variable.

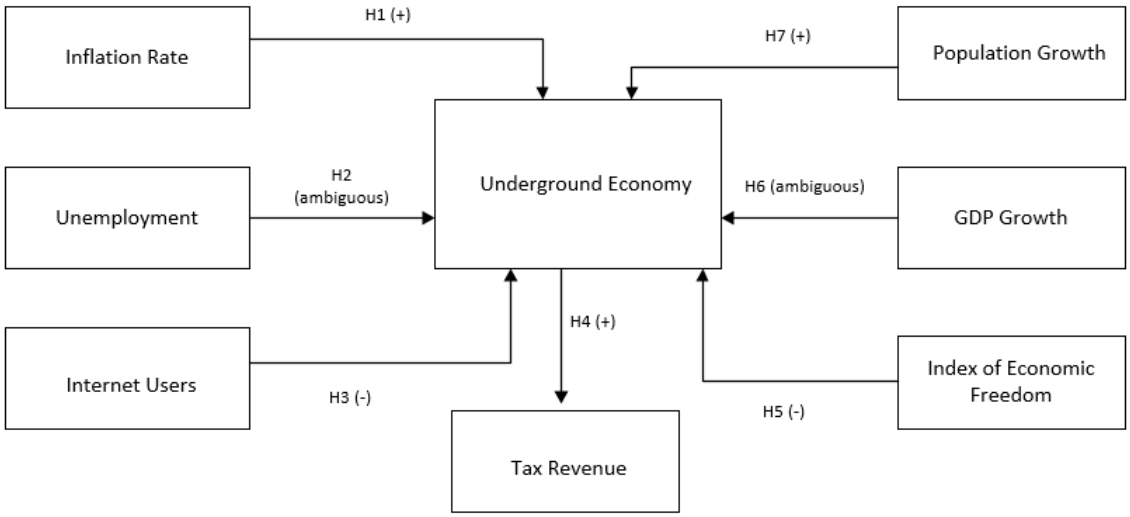

Figure 3.1. *Research Model*

NB: This figure is generated using Microsoft Visio by the author herself.

3.1 Hypotheses

The size of the underground economy in this study is determined by inflation rate, tax level, unemployment level, population growth, internet users, Index of Economic Freedom and GDP growth. The size of the underground economy is dependent while above mentioned determinants of underground economy are independent variables. The development of the hypotheses is done in the light of literature and economic theory. OLS model is developed to test the hypotheses which are as under:

> ***H1*****:** *There is a positive relationship between the size of the underground economy and the inflation rate, ceteris paribus*
>
> This hypothesis is developed by keeping literature general economic theory of inflation in perspective. Inflation is the rise in the level of prices over a specific period of time. High levels of inflation lower the living standards in a country and in order to maintain a source of living in

times of rising prices or multiple sources of income to meet the price hike, people resort to underground economy. Hence, high inflation puts an upward pressure on the growth of underground economies, other things remaining constant.

H2: *There is a significant relation between the size of underground economy and unemployment level but the direction of relationship is ambiguous, ceteris paribus*

According to economic reasoning, a high level of unemployment is likely to increase the size of shadow economy since labor force, upon unable to find jobs in the formal sector, will force to look for work in the informal sector. However, previous studies have established that in times of an economic downturn, rising unemployment will reduce the size of not only formal but informal sector. Economic recession will be felt in the underground economy too. Keeping all these possibilities in perspective, this hypothesis is ambiguous and subject to further testing.

H3: *There is a negative relationship between internet users and the size of the shadow economy, ceteris paribus*

This hypothesis is developed in the light of previous studies only. Considering the fact that increased usage of internet will increase awareness about underground economy and will deter corruption through dissemination of information across masses, this could reduce the size of shadow economy, with the assumption of other factors remaining constant.

H4: *There is a positive relationship between the size of underground economy and tax revenue, ceteris paribus*

The development of this hypothesis is done in the light of the literature review whereby high tax rates increase the size of shadow economy. If a major portion of the income is taken in tax, it discourages labor to operate in the formal economy. Since underground economy is hidden and therefore escapes taxes, high taxes urge labor to go underground and avoid them. Tax revenue is used in this study because of lack of availability of data on tax rates for the sample countries.

H5: *There is a negative relationship between Index of Economic Freedom and the size of underground economy, ceteris paribus*

The development of hypothesis is done in the light of previous studies. High index of economic freedom signifies a strong institutional structure and gives freedom of usage of resources with little government intervention. It also ensures security and protection of resources. Such a favorable business environment encourages entrepreneurs to operate in the formal sector hence lowering the size of shadow economy.

H6: *There is a significant but ambiguous relationship between GDP growth and the size of shadow economy, ceteris paribus*

In economic terms, increasing GDP is a sign of a prospering economy whereby the need to operate underground does not arise because there are opportunities in the formal sector. Although the validity of this explanation is seen upon investigating the literature, there are instances whereby rising GDP has increased the size of the shadow economy because of labor working few hours in the formal sector and operating underground at the same time. It is also likely due to inequality in the distribution of GDP across the economy. Thus, this hypothesis require further testing for a different time period, using a different measure of GDP and for a different sample of countries.

H7: *There is a positive relationship between population growth and the size of shadow economy, ceteris paribus*

Due to lack of literature on population growth for this type of study, this hypothesis is developed in the light of pure economic theory. Increasing population, especially in developing countries, is not properly tackled and is a burden on their scarce resources. A positive and high population growth therefore means more mouths to feed with less resources. This forces people to operate in the shadow economy and generate a source of income. As a consequence, the size of the shadow economy increases, others factors remaining constant.

4. RESEARCH METHODOLOGY

C.R Kothari (2004) states that '*Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. In it we study the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them*'. Keeping this concept in perspective, this section of the study describes the sources of data, how the variables in the study are measured, the sample countries and the time frame used, the tool used for data analysis and lastly the finished model which is estimated.

4.1 Research Design

This is a quantitative research and has made use of secondary data. Since it looks at four countries over a specific time period, it has made use of panel data. Ordinary Least Square has been used to test the model.

4.2 Measurement of Variables

4.2.1 Dependent variable

Shadow economy (% of official GDP): The study in question will be using calculations of shadow economy which are conducted by Hassan Mai and Friedrich Schneider (2016b) using MIMIC approach from 1999-2013. The study has measured shadow economy for 157 countries (including sample countries) and has provided the most recent estimates of the shadow economy from 1999-2013. Consequently in order to make use of the latest possible measures of shadow economy, data has been taken from this study. Studies by Friedrich Schneider on shadow economy measures have been used in numerous studies which is an indicator of their authenticity. Keeping this in perspective, this study has been used as a source of data.

4.2.2 Independent variables

- *Inflation*: CPI has been used to measure inflation. This type of measure reflects changes in the cost to an average consumer of acquiring a basket of goods and services. This measure of inflation is employed

by the study because it has been used widely in the literature as a suitable measure for capturing the change in prices overtime.

- *Unemployment***:** Unemployment refers to that part of labor force that is willing and able to work but cannot find a job. Unemployment as a percentage of total labor force is used in order to capture both male and female rates of unemployment. In order to avoid the problem of multicollinearity, separate male and female rates of unemployment are not used.
- *Internet users (per 100 users)*: This measure comprises individuals who have used internet from any location in the past 12 months and is out of 100 users of internet. This measure is used to define the variable because this is the most relevant way to use this variable for the study in question and is used as it is in previous studies.
- *GDP growth*: This refers to the annual growth rate of GDP at market prices based on local currency. Aggregates are based on constant 2010 U.S. dollars. GDP refers to the sum of gross value added by all the resident producers of an economy plus any taxes minus subsidies not included in value of the products (The World Bank, 2017). Due to less usage of this type of GDP measure, this study has used it in order to check its impact on GDP growth. This variable, being more explanatory for the sample countries in this study, is also another reason of including it in the model.
- *Tax*: Tax revenue as a percentage of GDP refers to obligatory payments needs to be made to central government for the purpose of public welfare. Tax revenue as a percentage of GDP has been used due to unavailability of data on tax rates, particularly for Bangladesh, India and Pakistan. Due to similar issue, there were some missing values in the data for tax revenue too however those values have been interpolated for this study using Microsoft Excel.
- *Index of Economic Freedom*: An overall governance index has been used comprising property rights, freedom from corruption, fiscal freedom, government spending, business freedom, labor freedom, monetary freedom, trade freedom, investment freedom and financial

freedom. This is the most crucial determinant of shadow economies across the globe hence this cannot be ignored in this study.

- *Population growth*: Annual population growth for a year is the exponential rate of growth of midyear population from previous to current year expressed as a percentage. Population is one of those variables that has strong implications for developing countries. Previous studies which are mostly based on developed countries' shadow economies have not made use of this variable therefore population growth is included in the model for this study in order to see its impact on developing countries' shadow economies. Like tax revenue, the data on population growth had some missing values which have been interpolated using Microsoft Excel.

4.3 Sample Countries and Time Frame

The countries selected for this study are Bangladesh, India, Pakistan and Turkey. The reason for choosing this particular sample is the fact that these countries are developing and emerging economies in Asia and the problem of shadow economy in these countries is likely to curtail their pace of development. Bulk of the literature on shadow economy has focused on developed countries. Consequently this study is conducted with the aim of taking a closer look at the developing countries' shadow economies since they are the ones in dire need of reform. In addition to this, most of the studies have provided estimates on underground economy but little research has been conducted with regards to its determinants. The study in question therefore aims to fill this gap.

The study will use data from 2000-2013. This is done in order to provide the most up to date results.

4.4 Data Collection

The data for Index of Economic Freedom is gathered from The Heritage Foundation. The source of data for the remaining independent variables is The World Bank. The data for shadow economy is gathered from (M. Hassan & Schneider, 2016a). These data sources are chosen because of their authenticity and the fact that they are the most used data sources in the literature relevant to the study in perspective. They have

also provided the data for the time frame used in this research. The study used to gather data on shadow economy provides a large panel data set which provides all the necessary data aimed to be used in this study.

4.5 Model

Since all the variables have been discussed and their relationships have been defined, it is a good time to put together everything we know in the form of a model below and test our hypotheses empirically. The model is then put to test and the findings are discussed in the sections that follow.

$$Y = \alpha + \beta 1 \pm \beta 2 - \beta 3 \pm \beta 4 + \beta 5 - \beta 6 + \beta 7 + \mu$$

Where;

Y = Size of shadow economy (% of official GDP)

α = Constant

β1 = Inflation (CPI)

β2 = Unemployment (% of total labor force)

β3 = Internet users (per 100 users)

β4 = GDP growth (annual %)

β5 = Tax revenue (% of GDP)

β6 = Index of economic freedom (out of 100)

β7 = Population growth (annual %)

μ = Error term

The model can be rewritten as:

Shadow Economy = α + *Inflation* ± *Unemployment* - *Internet users* ± *GDP growth* + *Tax revenue* - *Index of economic freedom* + *Population growth* + *Error term*

The signs in the model signify the hypothesized relationship between the independent variables and the shadow economy. The variables which have an ambiguous relationship with the shadow economy have both positive and a negative sign.

4.6 Data Analysis

Eviews is used for the estimation of the model in this study.

5. FINDINGS

This section of the study presents, analyzes and discusses the results obtained after the model in the previous section has been estimated using Eviews. The findings are discussed for each country separately followed by a comparative analysis.

Before discussing the econometric findings in detail, descriptive statistics of the data have been provided for the sample countries and their relevant variables overtime. This is followed by the graphical illustrations for each variable to show the trends in the data overtime. The graphical illustrations are generated using microsoft excel. Descriptive statistics and results of data estimation are generated with the help of Eviews. The data on shadow economy has been taken from Schneider and Hassan (2016b), index of economic freedom has been taken variables from The Heritage Foundation. The data on the remaining variables is gathered from The World Bank.

What follows in the next section is the portrayal of the descriptive statistics and graphical illustrations of the variables that are part of this study along with their brief explanations followed by the estimation results and their discussion. Y is shadow economy as a percentage of official GDP. ECONFREE is the index of economic freedom, GDP is the annual GDP growth, INF is the consumer price index, INTERNET is internet users, POP is the annual population growth, TAXREV is tax revenue as a percentage of GDP and UNEMP is the total rate of unemployment as a percentage of labor force. All the findings are presented in the same manner. The results are discussed for each country separately which is followed by a comparative analysis for all the sample countries.

5.1 Bangladesh

Table 5.1 below illustrates the descriptive statistics for Bangladesh. It can be seen that the mean value of shadow economy is almost 40% which is an alarming number. It has almost half of its economic freedom which should be higher. GDP growth is positive but could be higher while levels of inflation need to be controlled. Internet users are extremely low. Population growth is positive but seems under control. Tax revenue needs to be higher and is likely to indicate a narrow tax base. Levels of unemployment are positive and could be lowered.

Table 5.1. *Descriptive Statistics for Bangladesh*

Variable	*Mean*	*Median*	*Maximum*	*Minimum*	*Std. Dev.*
Y	39.02643	38.98000	47.17000	31.10000	4.695831
ECONFREE	50.00000	50.55000	53.20000	44.20000	2.765168
GDP	5.719956	5.792699	7.058636	3.833124	0.901181
INF	6.473440	6.905940	10.70480	2.007174	2.572960
INTERNET	2.083951	1.400000	6.630000	0.071039	2.190246
POP	1.424316	1.271654	1.949448	1.109062	0.310506
TAXREV	7.444125	7.091059	9.024567	6.145612	0.894977
UNEMP	4.221429	4.350000	5.000000	3.300000	0.499505

The next part of the study presents the findings generated from estimating the model developed in the previous section.

Table 5.2. *OLS Regression Results for Bangladesh*

Variable	*Coefficient*	*t-statistic*	*Prob.*
C	56.02052	1.443487	0.1990
ECONFREE	-1.569758	-2.914984	0.0268
GDP	0.862371	0.490924	0.6409
INF	1.163319	1.412883	0.2074
INTERNET	1.184422	0.660155	0.5337
POP	20.07943	1.784367	0.1246
TAXREV	2.568642	0.584422	0.5802
UNEMP	-0.274461	-0.057700	0.9559
R-squared = 0.68 Adjusted R-squared = 0.302			
F-statistic = 1.81 Prob(F-statistic) = 0.244			
Durbin-Watson stat = 1.99			

NB: The results in the table are obtained after estimating the econometric model using OLS. The results are generated using Eviews. The coefficients of the variables show how much shadow economy will change if there is a one unit change in them. The t-stats show how extreme the coefficients are while prob or the p-value show the significance of the results. If the p-value is less than 0.05 at 5% significance level or 0.1 at 10% level of significance, it means that our coefficients are significant.

The above results have been obtained for Bangladesh. R^2 for the model is high however the adjusted R^2 is low which means that there are other factors that have an impact on the size of the shadow economy in Bangladesh but are not part of this model.

The hypothesis for the relationship between GDP growth and shadow economy has been ambiguous for this study but the results indicate that increase in GDP growth in Bangladesh increase the size of the shadow economy. This can be linked to the low insitutional quality in Bangladesh. Literature on underground economy explains that impact of GDP on it cannot be looked at in isolation rather how that growth is spread is important. Despite positive GDP growth in Bangladesh, the low institutional quality implies an uneven spread of economic development and hence people are forced to operate underground to exploit an income source. This is further supported by the fact that the impact of index of economic freedom on shadow economy is significant and the relationship is in line with the hypothesis and the previous studies. This means that better governance and high institutional quality in Bangladesh is likely to reduce the size of its shadow economy and viceversa. High inflation, calculated as consumer prices increases the size of shadow economy in Bangladesh. The effect of inflation is not significant though. The hypothesis for this study states that internet users and shadow economy are negatively related however incase of Bangladesh, this relationship is positive though it is not significant. This relationship could be due to tax evasion effect. Tax evasion and tax avoidance are normal in Bangladesh (Haque, 2013) and increased usage of internet makes tax evasion easier since all transactions are electronic. This, coupled with the record high levels of corruption (Monir, 2012) has lead to increased usage of internet contributing to increased shadow economy. Lack of proper governance and accountability framework means people have freedom to operate informally. Population growth and the size of underground economy are positively related and this result is in line with the hypothesis of the study. The same exists for tax revenue. The hypothesis for this study states that an ambiguous relation exists between total unemployment rate and shadow economy but in case of Bangladesh, it can be seen that these two variables are negative related, however the impact is highly insignificant.

As far as autocorrelation in the model is concerned, the Durbin-Watson statistic is quite close to 2 which means that autocorrelation is almost negligible.

5.2 India

Table 5.3. *Descriptive Statistics for India*

Variable	*Mean*	*Median*	*Maximum*	*Minimum*	*Std. Dev.*
Y	21.65357	21.50500	23.77000	20.67000	0.858806
ECONFREE	52.40714	53.00000	55.20000	47.40000	2.355832
GDP	6.923978	7.249597	10.25996	3.803975	2.219240
INF	6.908633	6.257760	11.99230	3.684807	3.061345
INTERNET	5.020130	3.377750	15.10000	0.527532	4.603532
POP	1.514926	1.521596	1.772114	1.251191	0.168142
TAXREV	10.01401	10.06038	12.26625	7.940208	1.207342
UNEMP	3.928571	3.900000	4.400000	3.500000	0.317269

Table 5.3 above shows the descriptive statistics for India. Of all the sample countries, India has the smallest shadow economy. The country's economic freedom index could be improved though. GDP growth seems favorable however inflation rates are quite high and could be lowered. The level of internet users could be increased as well. Population growth is somewhat similar to that in Bangladesh. The level of tax revenue, if increased, is likely to favor its economy in the long-run. Level of unemployment is stable for India.

Table 5.4. *OLS Regression Results for India*

Variable	*Coefficient*	*t-statistic*	*Prob.*
C	47.71591	1.346153	0.2269
ECONFREE	-0.569662	-1.692109	0.1416
GDP	-0.088117	-0.622925	0.5563
INF	0.373345	2.150736	0.0750
INTERNET	-0.053733	-0.230520	0.8253
POP	-0.195896	-0.018388	0.9859
TAXREV	0.356343	1.127428	0.3026
UNEMP	-0.300128	-0.256839	0.8059
R-squared = 0.61 Adjusted R-squared = 0.16			
F-statistic = 1.35 Prob(F-statistic) = 0.37			
Durbin-Watson stat = 2.78			

The results from the OLS regression for India are shown in table 5.4 above. The overall model is not significant, the R^2 is reasonable but the adjusted R^2 is extremely low. GDP growth and shadow economy are negatively related which means that an increase in GDP growth will reduce the size of underground economy in India. The impact of this variable is insignificant though. Index of economic freedom is not significant however its impact on the shadow economy in India is in accordance with the hypothesis of the study. Inflation has a positive relation with the size of the shadow economy in India and is a significant variable at 10%. The relationship between internet users and the size of the shadow economy in India is insignificant but is in accordance with the hypothesis of this study. Population growth and the size of the shadow economy are negatively related which means increase in growth of population in India will reduce its shadow economy. This can be explained in the light of increasing literacy rate in India which absorbs the increasing population in the formal sector as opposed to the informal. Increasing literacy rate in India has been observed overtime (India, 2015) which means that despite positive population growth, increasing literacy levels mean that the increasing but educated population is absorbed in the formal sector of the economy hence reduced size of the shadow economy. The impact of population growth is highly insignificant though. Even though the impact of tax is insignifcant, an increase in tax boosts shadow economy as per the hypothesis of this study. Increasing rate of unemployment reduces the size of shadow economy but is a highly insignificant variable for India.

Autocorrelation is likely to exist in this model since DW statistic is far from 2. This can be reduced by taking lagged values for the model.

5.3 Pakistan

The descriptive statistics for Pakistan indicate that the size of its shadow economy is high, on average. It is smaller than Bangladesh's and Turkey's underground economy but larger than India's. Index of economic freedom is almost similar to that for India and Bangladesh but could be increased. GDP growth is positive but slow. The level of inflation in Pakistan is alarmingly high and must be controlled. Internet users seem to be rising but it should take place at a rapid pace. Population growth is slightly higher than for India and Bangladesh. Tax revenue as a percentage of GDP is too low and calls for a reform. Level of unemployment could be lowered.

Table 5.5. *Descriptive Statistics for Pakistan*

Variable	*Mean*	*Median*	*Maximum*	*Minimum*	*Std. Dev.*
Y	31.02643	31.21000	36.05000	26.25000	2.843353
ECONFREE	55.65714	55.40000	57.90000	53.30000	1.183680
GDP	4.082229	3.883561	7.667304	1.606692	1.959905
INF	8.775248	7.805294	20.28612	2.914135	4.912232
INTERNET	6.226699	6.650000	10.90000	0.080000	3.111335
POP	2.093681	2.085586	2.262172	2.027808	0.062938
TAXREV	9.972835	10.06580	11.18386	8.943092	0.627940
UNEMP	6.171429	5.650000	7.800000	5.000000	1.176323

Table 5.6. *OLS Regression Results for Pakistan*

Variable	*Coefficient*	*t-statistic*	*Prob.*
C	28.29728	0.417155	0.6911
ECONFREE	-0.526011	-0.813478	0.4470
GDP	-0.985646	-3.234068	0.0178
INF	-0.106955	-0.584470	0.5802
INTERNET	0.396913	0.672431	0.5263
POP	10.45869	0.776815	0.4668
TAXREV	1.540513	1.494535	0.1857
UNEMP	-0.447917	-0.251996	0.8095
R-squared = 0.87 Adjusted R-squared = 0.71			
F-statistic = 5.66 Prob(F-statistic) = 0.025			
Durbin-Watson stat = 2.24			

The model for Pakistan is significant since the p-value of F-statistic is significant at 5% and both R^2 and the adjusted R^2 are high. It can be seen that an increase in GDP growth reduces the size of the shadow economy which means that overall economic development in Pakistan discourages people to operate underground. This is a significant variable in explaining the size of the shadow economy in Pakistan. Although the relation between index of economic freedom and shadow economy is in accordance with the hypothesis, the relation is insignificant. The same can be observed for inflation and the shadow economy. Increase in inflation has a negative impact on the size of the shadow economy in Pakistan though it is not a significant variable. A possible explanation for this

could be that soaring prices makes it difficult for people to start businesses in the informal sector. Increase in internet users increases the size of the underground economy but its impact is not significant. Although the relationship between population growth and the size of underground economy is in harmony with the hypothesis for this study, the impact is not significant. Tax revenue and shadow economy in Pakistan are, however, positively and related. This means that the amount taken away in taxes acts as an incentive to operate in the underground economy in order to escape the taxes. This indicates that the tax base in Pakistan is narrow and tax system is corrupt and complicated due to which tax revenue as a portion of GDP is low and the size of the underground economy is high. Lastly, it can be seen that increase in total unemployment rate decreases the size of the shadow economy in Pakistan even though this relationship is not significant. Durbin-Watson statistic for this model is almost close to 2 which means autocorrelation is not present in this model.

5.4 Turkey

Table 5.7. *Descriptive Statistics for Turkey*

Variable	*Mean*	*Median*	*Maximum*	*Minimum*	*Std. Dev.*
Y	37.65571	38.38000	43.30000	29.51000	4.173493
ECONFREE	58.77143	60.25000	64.20000	50.60000	4.766135
GDP	4.422515	5.714552	9.362808	-5.697476	4.839357
INF	19.05502	9.867824	54.91538	6.250977	18.26234
INTERNET	25.32906	23.43500	46.25000	3.761685	15.35989
POP	1.441290	1.441582	1.819639	1.173172	0.204222
TAXREV	17.98895	17.98895	21.39835	14.69949	2.131077
UNEMP	10.16429	10.35000	14.00000	6.500000	1.730988

Table 5.7 above is an illustration of the descriptive statistics for Turkey which show that on average, the size of its shadow economy is quite high, second to Bangladesh. However, index of economic freedom in Turkey is highest among the sample countries and could be improved further. GDP growth is quite slow but this can be attributed to the fact that Turkey faced serious economic crisis in the past. This can be reflected by its extremely alarming inflation levels which require immediate reform. Internet users are highest in Turkey when compared with the sample countries of this study. Population growth is similar to the other countries. Similarly tax revenue as a percentage of GDP is the highest. Unemployment rates are quite high and should be controlled.

Table 5.8. *OLS Regression Results for Turkey*

Variable	*Coefficient*	*t-statistic*	*Prob.*
C	68.30317	2.418944	0.0519
ECONFREE	-0.608254	-2.326785	0.0589
GDP	-0.094418	-0.614051	0.5617
INF	0.298708	2.511239	0.0458
INTERNET	0.628675	2.866388	0.0286
POP	-2.488129	-0.434670	0.6790
TAXREV	-1.658918	-0.902761	0.4014
UNEMP	1.705059	2.957404	0.0254
R-squared = 0.88 Adjusted R-squared = 0.73			
F-statistic = 6.05 Prob(F-statistic) = 0.022			
Durbin-Watson stat = 2.52			

The overall model is significant at 5% since the p-value of F test is less than 0.05. Both R^2 and the adjusted R^2 are high which means that the model is explanatory and well fitted for Turkey. The impact of GDP growth on Turkey's shadow economy is insignificant. GDP has an ambiguous impact on the size of the shadow economy according to the hypothesis of this study however it can be seen that GDP growth reduces the size of Turkey's shadow economy which means that economic development in Turkey is evenly spread out, hence lowering the incentive to operate informally. Inflation and underground economy in Turkey are positively related which is in line with the hypothesis of the study. It is also significant at 5%. Tax revenue does not have a significant impact on the shadow economy of Turkey and the relationship is not in harmony with the hypothesis of the study. A possible explanation for this could be high tax morale in Turkey which encourages them to pay taxes, a wide tax base which increases the spread of tax burden. Less corrupted and simple tax system also means that people are motivated to pay taxes because they trust that the government will use the tax revenue on public welfare. These factors put a downward pressure on the shadow economy of Turkey. Index of economic freedom is significant at 10% and better governance and institutions in Turkey mean a reduction in the size of its underground economy. It can be seen that increase in internet users increase the size of the shadow economy in Turkey and the impact is significant at 5%. Increase in population, however, lowers the size of the shadow

economy though its impact is not significant. Lastly, increasing rate of total unemployment in Turkey is a positive and significant driver of its shadow economy. This can be linked with the explanation provided in the literature whereby shadow economy acts as a savior for the unemployed, who, unable to find work in the formal economy look for an income source in the shadow economy.

Lastly keeping the Durbin-Watson statistic in perspective, it can be concluded that there exists some autocorrelation in the model.

5.5 Comparative Analysis Between Bangladesh, India, Pakistan and Turkey

This part of the findings is provides a comparative analysis between the sample countries and analyzes the reasons for differences as well as similarities between their results. Before discussing this part of the study in detail, graphical illustrations have been provided for all countries for each variable in order to provide, at a glance, a visual comparison between the variables of the sample countries overtime. It will help identify how the variables for the countries have changed and at the same time, will aid comparison for each country during the time frame for this study. All the graphs are generated using Microsoft Excel by the author herself.

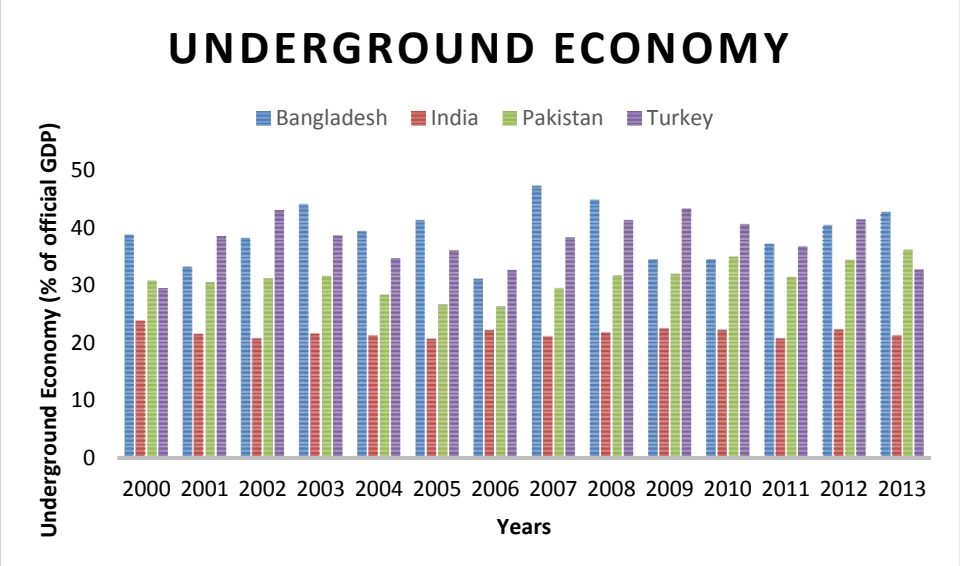

Figure 5.1. *Underground Economy in Sample Countries from 2000-2013*

Figure 5.1 above shows the shadow economies of the four sample countries that are part of this study and shows how their sizes vary overtime. It can be seen at a glance that of all the countries, the size of Bangladesh's shadow economy is the highest followed by Turkey. India has the smallest shadow economy and its size is stable and has a decreasing trend overtime. The sizes of the shadow economies of Bangladesh and Turkey are fluctuating overtime. Slight fluctuations in the size of Pakistan's shadow economy can also be seen. The highest level of shadow economy can be seen for Bangladesh in 2007 while the lowest is for India in the year 2011. It can be concluded that Bangladesh and Turkey are relatively in a greater need for a reform that can enable them to curtail the size of their shadow economies.

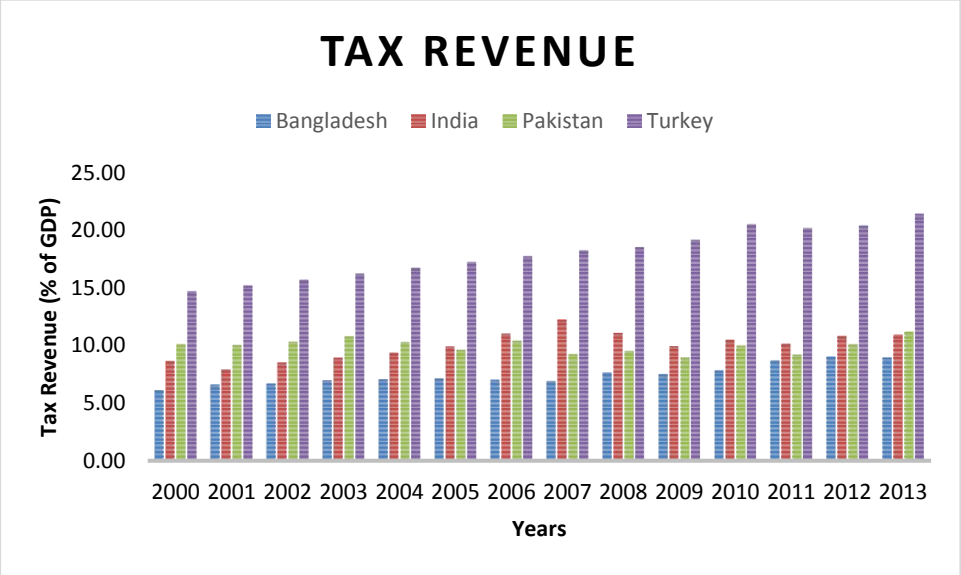

Figure 5.2. *Tax Revenue in Sample Countries from 2000-2013*

From figure 3 above, it can clearly be seen that Turkey has the highest tax revenue (% of GDP) throughout. The difference between Turkey's tax revenue and that of other countries is quite large. It can be generalized that the tax system in Turkey more efficient as opposed to its counterparts. The tax revenue of Bangladesh is lowest throughout in comparison with the other countries however it is slowly rising overtime. India has struggled to improve its tax revenue overtime though a slight decline can be seen in its tax revene after 2007. The same can be seen for Pakistan however the level of increase in India is more than in Pakistan. Keeping this analysis in perspective, it can be concluded that Bangladesh should revisit its tax system and design it to facilitate an increase in its

tax revenue. Pakistan and India seem to be struggling for improvement and can devise a better fiscal policy framework in order to do so.

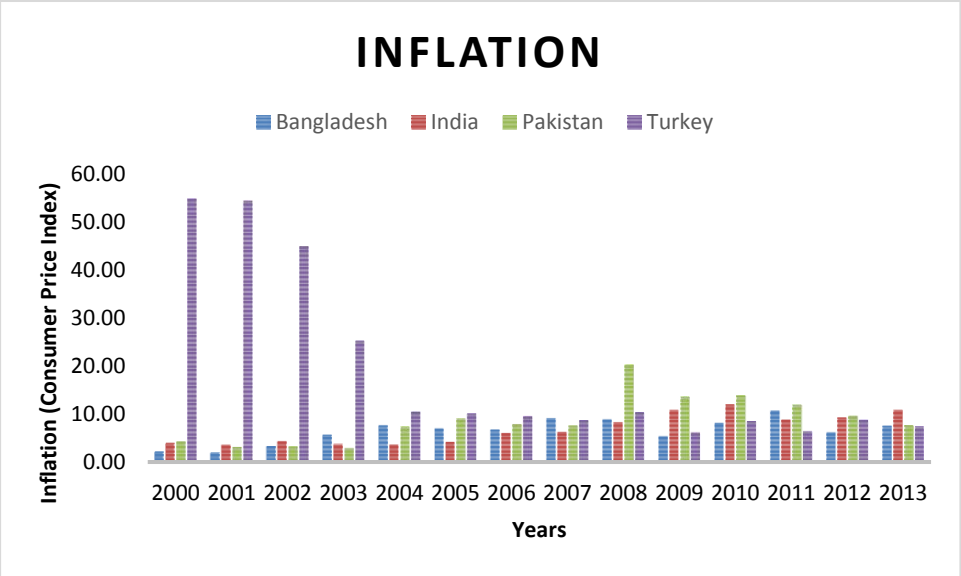

Figure 5.3. *Inflation in Sample Countries from 2000-2013*

Figure 5.3 clearly portrays that Turkey has done well in terms of significantly reducing its high levels of inflation overtime. Turkey has, in the past, been hit by several financial and economic crises which have made it volatile but the economy has recovered well. After 2003, Turkey's inflation rate seems stable until 2013. The situation of inflation in Bangladesh and India looks stable, with slight increases and declines in their CPIs. A releatively higher rate of inflation can be seen in Pakistan, especially in 2008 which is likely to be due to change in government and global economic recession.

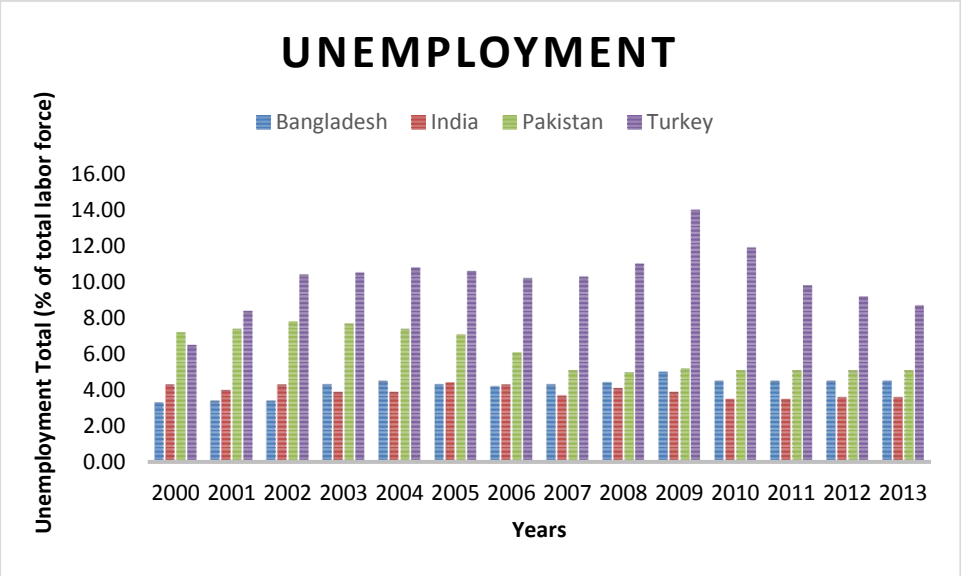

Figure 5.4. *Unemployment in Sample Countries from 2000-2013*

Figure 5.4 clearly shows that of all the sample countries, the highest level of unemployment between 2000-2013 can be seen in Turkey, especially from 2007-2009, likely due to the global economic recession although its impact was relatively not significant for the other countries. Previous studies on Turkey's shadow economy have also highlighted its macroeconomic problem of high unemployment and the data is in accordance with those studies. It is needless to say that overall trend of unemployment is increasing for Turkey. With regards to Pakistan, it can be seen that overtime, the country managed to bring down its level of unemployment, especially after 2006. India and Bangladesh seem to have stable levels of unemployement, with no drastic changes throughout.

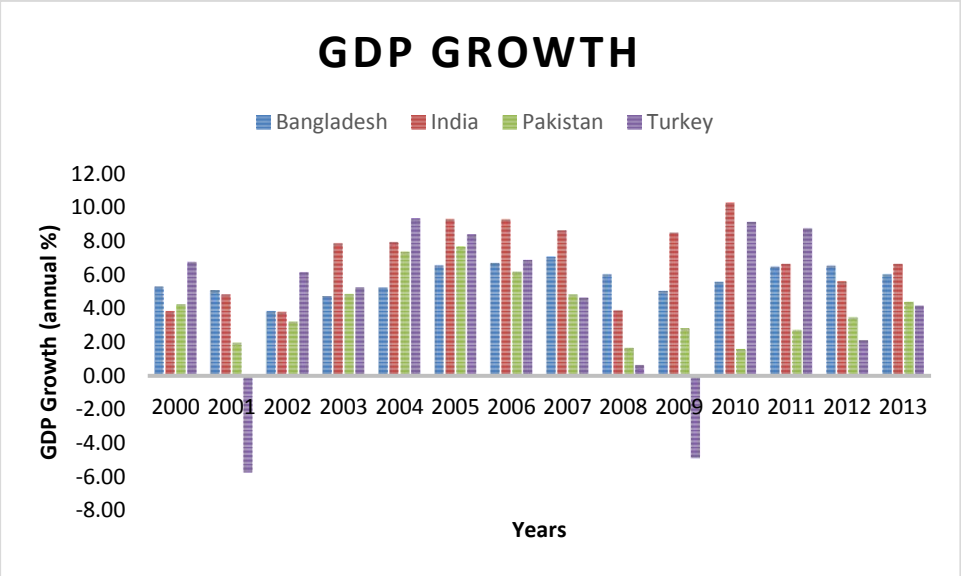

Figure 5.5. *GDP Growth in Sample Countries from 2000-2013*

Figure 5.5 above shows the annual GDP growth for the sample countries overtime. It can again be seen that Turkey stands out as opposed to the other countries since it is the only country in the sample that faced negative GDP growth which means falling levels of GDP in 2001 and 2009 though it must be added that it has recovered well, especially after 2009. The other countries have positive GDP growth rates which means that their GDP was growing overtime. The highest rates of GDP growth can be seen for India. Although the rate of GDP growth in Bangladesh is slow in comparison to Pakistan, it has relatively greater stability.

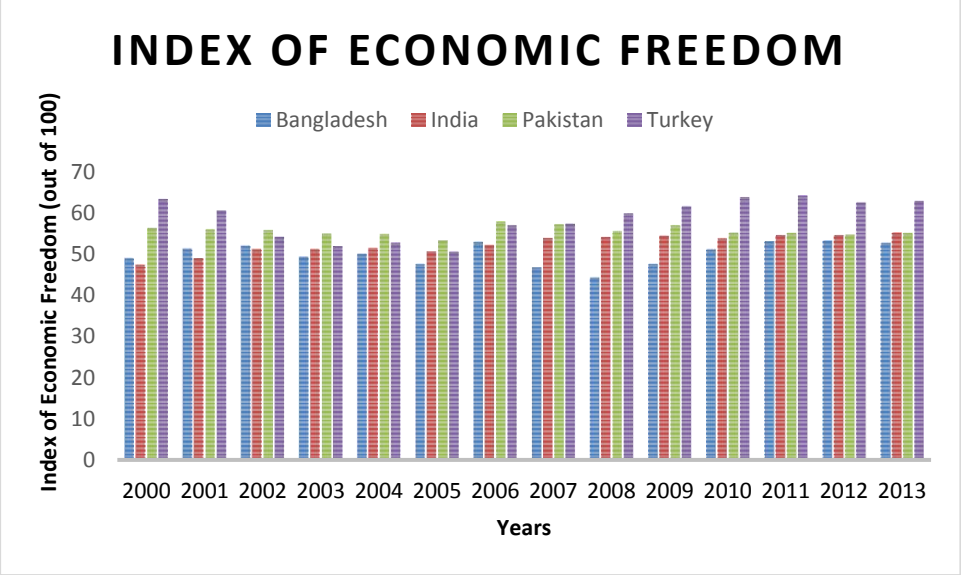

Figure 5.6. *Index of Economic Freedom for Sample Countries from 2000-2013*

Almost all countries are similar to each other in terms of economic freedom but a detailed look at this figure shows that Turkey has the highest level of economic freedom, followed by Pakistan, India and Bangladesh. There are no drastic oscillations in the index overtime for any of the countries however there is enough room to increase this index further.

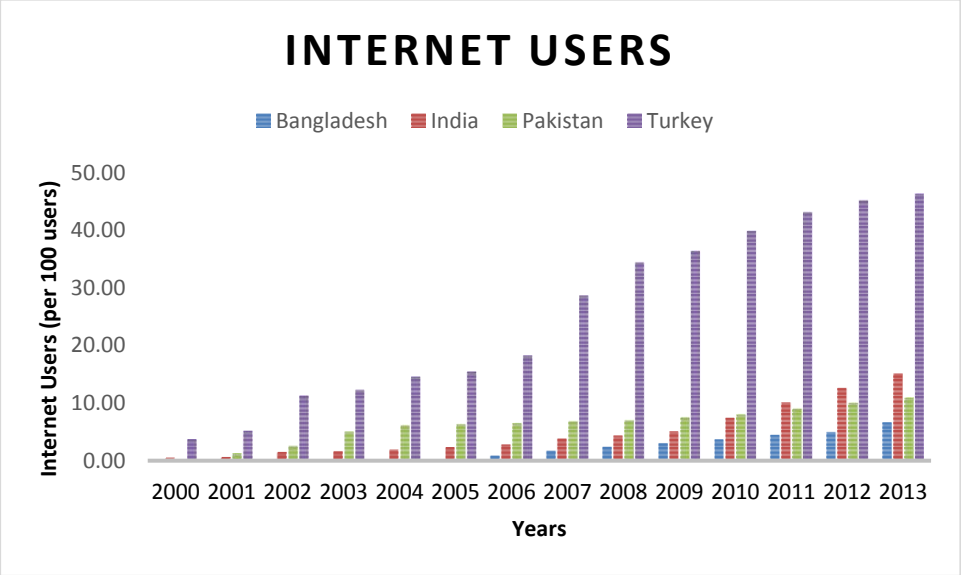

Figure 5.7. *Internet Users for Sample Countries from 2000-2013*

From the figure above, it is clear that the trend of internet users is increasing for all the countries, with Turkey having the most rapid increase overtime, followed by India, Pakistan and Bangladesh. This indicates that Turkey has the strongest infrastructure while there is a dire need for one in Bangladesh. With regards to India and Pakistan, the growth in internet users exists but the rate of growth is terribly slow. The countries need to have a strong infrastructure in place.

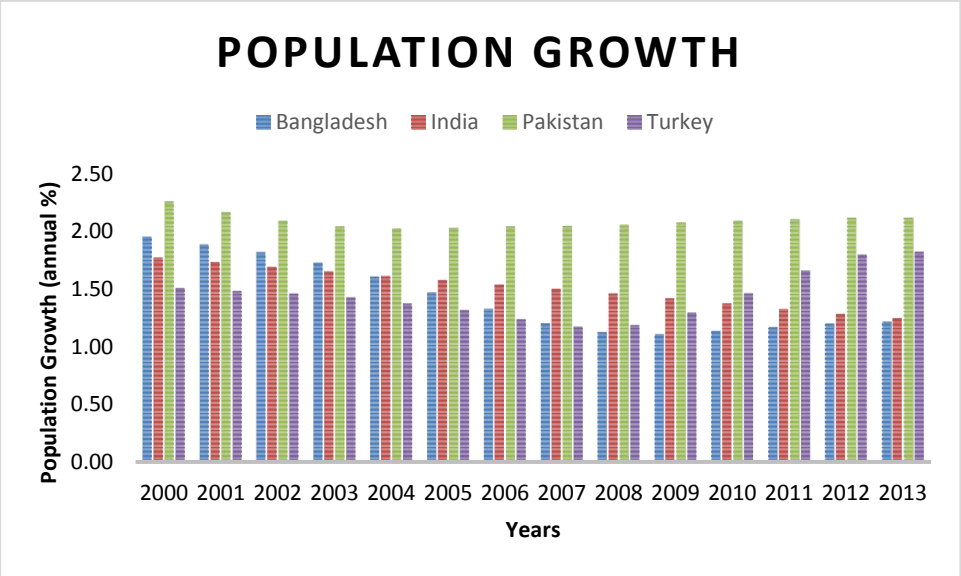

Figure 5.8. *Population Growth for Sample Countries from 2000-2013*

With regards to population growth, Pakistan seems to be on top. The growth rates are positive for all the countries which means that population has been increasing throughout. Pakistan's rate of increase is the highest and looks stable overtime. India and Bangladesh have almost similar rates of population growth however Bangladesh managed to lower its growth rate overtime. For India, however, the decline has been slow. Although Turkey has lower rate of population growth initially, it grew at an increasing rate after 2008.

Keeping the entire comparative and absolute analysis in perspective, it can be concluded that of all the sample countries, India seems to be a promising economy, with its smallest shadow economy, with its falling levels of inflation and unemployment and stable economic growth. Its economy can improve further if a proper tax system is devised and economic freedom is enhanced. Turkey has its strengths, especially in terms of a strong infrastructure and an effective tax system, it has faced several crises in the past which have lead to violent oscillations in its GDP growth and unemployment. Better macroeconomic policies can enable it to control these indicators for the years to come. Pakistan seems to be a struggling economy that needs to control its population and enhance the effectiveness of its fiscal policy. Macroeconomic policies that target high levels of inflation can also prove to be fruitful. Bangladesh is the weakest economy of all the sample countries and is struggling to grow gradually but at an extremely slow pace. The likely explanations for this could be an unfavorable government and high levels of

corruption. Better macroeconomic and public policies are inevitable to enhance its economic growth and prosperity.

The section that follows provides a detailed comparative analysis with regards to the findings of the estimated model, discusses the similarities and differences between results and their likely reasons.

The foremost common aspect of the results of the four sample countries is the negative relation between index of economic freedom and their shadow economies. Since economic freedom comes from the institutions and governance, this indicates that a strong institutional framework leads to a reduction the shadow economy. This has also been proved by previous studies. Although the direction of relationship is similar across all the countries, it is not as such in India and Pakistan. A possible explanation for this could be the lack of trust between the public and the government due to which less importance is attached to the institutions in these countries. It is important for them to make sure that law and economic freedom does not exist only on paper rather its proper enforcement is ensured. This could prove to be a milestone for their government in gaining the trust of the public. Though the quality of institutions in India are relatively better than Pakistan's, they could further be improved in order to enhance its economic freedom.

As far as the link between GDP growth and shadow economy is concerned, it can be seen that GDP growth reduces the size of shadow economy in all countries. A negative relation between GDP growth and shadow economy is an indicator of rising living standards hence no motivation to operate underground for income. However, Bangladesh is an exception in this case. This means that despite economic development, people there are still operating in the informal economy which could be linked to the accumulation of economic welfare in a few hands instead of being distributed across the country. Another possible explanation for this relationship could be a reduction in the working hours in the formal economy and using those hours in shadow economy. This is likely to be the norm due to lack of accountability and high level of institutional negligence in Bangladesh. Both positive and negative relationships are likely between GDP and shadow economy, as established by the literature, and this study is in line with it since both links have been found.

Population growth and shadow economies are positively linked in Bangladesh and Pakistan which means that population increase is absorbed by the shadow economy to enable people to make ends meet. Most of these countries' population is less likely to be educated and skilled enough to work in the formal sector since these countries are already in the low income cohort and have few resources at hand to feed more mouths. This is in contrast to Turkey and India whereby population growth reduces the size of shadow economy. This could be linked to better quality of the population which is skilled and educated to be absorbed by the formal sector. They have therefore little incentive to work in the informal sector.

With regards to inflation and the size of shadow economy, it can be seen that inflation gives rise to shadow economy in all the countries except Pakistan. This could be due to the fact that operating underground is not a way out in times of soaring prices and it is difficult and costly for people to set up businesses in the shadow economy to make ends meet. The results obtained for the remaining countries are in accordance with the hypothesis.

An increase in internet users boosts the size of shadow economy in all the sample countries. This can be linked with lack of accountability and misuse of ICT in these countries. If not monitored carefully, rise of electronic transactions via internet is also likely to put an upward pressure on the size of the shadow economies in these countries. On the other hand, the opposite is true for India which could be linked with better transparency and an effective use of ICT that boosts productivity and reduces the level of shadow economy. Increased usage of internet can also mean creation of more jobs in the formal sector which can also explain why increasing population in India puts a downward pressure on its shadow economy. The relation between internet users and shadow economy established in this study is different from previous studies whereby increase in internet users lower the size of the underground economy but such relationship is most likely to hold true for developed countries. Developing countries like India can be considered an exception in this context.

In all the sample countries, increasing unemployment lowers the size of the shadow economy. Previous studies on unemployment and shadow economy highlighted that a general economic downturn is likely to reduce the size of shadow economy in times of rising unemployment. This can be seen in Bangladesh, India and Pakistan. This does not

hold true for Turkey whereby rising unemployment increases the size of its shadow economy. This means that high unemployment in its official economy forces people to move underground. The economic downturn in the sample countries seems to be more severe as opposed to in Turkey. This means that Turkey is slightly economically better off than its counterparts. The literature has established both positive and negative links between unemployment and the size of the shadow economy with their possible explanations and the findings of this study are also in sync with the previous studies.

With regards to the relationship between tax revenue and the size of shadow economy, it can be seen that high tax revenue boosts the size of shadow economies in all the sample countries except Turkey. While previous studies have stated the impact on shadow economy of taxes to be positive and significant, they have specified taxes to be tax burdens and tax rates. Tax revenue is a tricky variable that does not imply tax burden since tax revenue has several sources and in countries with a wide tax base, high tax revenue is likely to be an indicator of a strong fiscal framework and provision of better quality public goods and services. Nevertheless a wide tax base and an effective system of taxation is a feature mostly seen in developed countries. The focus of this study is on developing countries with narrow tax bases and a complicated and an ineffective tax system. This could also mean that bulk of the tax revenue for these countries comes from a limited source which means there exists tax burden on a handful of tax payers, forcing them to escape the high taxes and going underground, leading to a positive relationship between tax revenue and the size of shadow economies in these countries. On the other hand, tax revenue and shadow economy are negatively related in Turkey, indicating a relatively better tax system and fiscal framework. Furthermore, high tax revenue is spent on the provision of more and better public goods and services which ultimately improves the quality of life in a country, lowering the incentive to work in the shadow economy in the long-run. The chances of this happening in Bangladesh, India and Pakistan are thin due to high levels of corruption and greater usurption of tax money. This boosts lack of trust between the public and the government, hence drastically affecting the tax morale of the public which lowers tax revenue further. Consequently, a vicious cycle of low tax revenue and increasing shadow economy begins and this is likely to be the case for Bangladesh, India and Pakistan.

It can also be seen that out of the variables included in the model for this study, Turkey's shadow economy is significantly determined by most of them i.e. four variables. Other three countries in the sample are affected by two variables. This means that the model of this study is most fitted to explain the shadow economy in Turkey, followed by Pakistan, Bangladesh and India. A likely explanation for this difference is the fact that Turkey's situation is more similar to OECD and European countries. Bangladesh, India and Pakistan have shared history, geography and resources and their economic situations are somewhat similar to each other. There are structural commongrouds which are shared by these countries but this does not apply to Turkey. As a consequence, these differences are seen between them. There are several other determinants of shadow economy which have a relatively greater impact on Bangladesh, India and Pakistan namely level of literacy and poverty but due to missing values in their data, those variables could not be included in the study. İnclusion of those variables would have yielded more explanatory results for these economies. Nevertheless, with the passage of time and an improvement in the data collection systems of these countries, future studies on shadow economies can make use of those determinants and take a step forward.

Keeping the overall significance of the models in perspective (using p-value of F statistic), it can be observed that the variables included in the models are better explanators of the size of the shadow economies in Pakistan and Turkey as opposed to India and Bangladesh. This means that there are other explanators of shadow economies in Bangladesh and India which are not included in this model. Furthermore, there could also be a possibility that same variables explain the shadow economies in these countries but are measured differently from the measures used in this study. Most of the results obtained in this study are in line with the previous studies conducted on shadow economy, with internet users being an exception in some cases. Population growth is a new variable used in this model which has been mostly used in labor market models in previous studies. Since most of the studies conducted on shadow economy are focused on developed countries where population is not a significant determinant, it is not surprising to see the absence of studies that use population as a determinant of shadow economy in developing countries.

6. CONCLUSION & RECOMMENDATIONS

The first research objective of this study was the identification of factors which determine the size of shadow economy in Bangladesh, India, Pakistan and Turkey and this study, keeping previous studies on shadow economy as well as the determinants which are specific to these emerging economies in perspective, managed to identify seven factors that are likely to significantly affect these shadow economies. There are several other factors which are significant determinants of their shadow economies namely poverty and literacy rates but due to missing values in their data, those factors could not be incorporated in the model. Nevertheless future studies on shadow economies in developing countries can integrate those variables.

In the light of the second and third objectives of this study, the impact of the identified factors on the shadow economies of the sample countries has been measured and the results for the countries have been analyzed and discussed along absolute and comparative dimensions. The analysis has identified the factors with the most and least impact on the shadow economy, the direction of the impact, the extent to which the hypotheses of the study have been met, new findings and their likely reasons. For this purpose, this study has made use of ordinary least square econometric technique and has used secondary data for shadow economy and its determinants for the sample countries from 2000-2013. This time limit has been chosen in order to provide the most up to date results. Underground economy is not easy to measure since it is hidden from official measures of GDP therefore gathering its data is difficult and a time consuming task. Keeping this aspect of underground economy in perspective, previous studies have managed to provide its estimates until 2013. Furthermore, due to the absence of direct data on shadow economy, the study has taken this data from authentic literature that has provided measures on shadow economy for sample countries. Shadow economy is treated as a dependent variable in this study and is dependent on seven variables which have an impact on its size. Variables whose impact on the shadow economy of developing countries has been rarely measured namely internet users and population growth have been added to the model in this study which is an addition to the literature. Important variables like taxes and index of economic freedom which have been viewed as significant determinants of shadow economy across the globe are also added and their

impact on specific group of countries has been analyzed. In addition to this, relationship between GDP and unemployment has been seen as ambiguous in previous studies and this study has used those variables to see their impact from another aspect by using different indicators for them. The model is then put through Eviews and the results have been obtained. The impact of Index of Economic Freedom has been found to be significant and in harmony with the hypothesis across all countries except Pakistan where tax revenue is significant. Similarly, shadow economies of India and Bangladesh are positively affected by tax revenue which indicates a narrow tax base in these economies. Turkey, on the other hand, has a negative relationship with tax revenue. While previous studies have highlighted tax rates as determinants of shadow economies, this study has used tax revenue. Using this has enabled us to find that it is the narrow tax base and absence of efficient fiscal framework in developing countries that has put an upward pressure on their shadow economies. Turkey, being relatively more developed seems to have a negative relationship with tax revenue which is an indicator of its better tax system.

Tax revenue is the type of variable whose increase is a sign of economic progress and public welfare since high tax revenue means that government has more funds to spend on the betterment of the public. The opposite can be seen in developing countries whereby high tax revenue is likely to be considered a sign of more funds being taken away from public for the benefit of government itself instead of injected back into the economy. This is in contrast to Turkey where tax revenue guarantees public welfare. This is a striking difference between developing and developed countries.

The impact of economic freedom is significant for 2 out of 4 sample countries. The literature on shadow economy has established that regulations and proper law enforcement is more important than taxes in determining the size of the shadow economy and this study has arrived at similar results. However, it is different for Pakistan and India, owing to high levels of corruption and policies leading to unfriendly business and economy environments in these countries.

Variables like population growth is a pivotal determinant for developing countries' shadow economy hence it is included in the model for this study. It is found to give rise to the shadow economy in Bangladesh and Pakistan but not in India and Turkey. The impact of this variable is not significant and controlling factors namely level of literacy

and corruption are likely to exist in this scenario. These variables are open to further and detailed exploration for future studies.

This study has also gauged the impact of internet users on shadow economies of sample countries because there is a dearth of studies that have analyzed its impact on developing countries' shadow economies. The findings for Turkey, Bangladesh and Pakistan as not in sync with the hypothesis however the opposite is true for India. This indicates lack of transparency in all the other economies and an efficient usage of ICT in India. This study is a base for future studies to use this variable as a determinant of shadow economies in developing countries.

This section aims to achieve the final objective of this study i.e. the policy recommendations that can help reduce the size of shadow economies in these countries. It has been established that the existence of a large shadow economy is a threat to the macroeconomic and public policy framework of a country. Its hidden nature makes economic forecasting and setting policy objectives difficult. Moreover, presence of shadow economies mean great loss of tax revenue for the government which eventually weakens the fiscal sector and its policy framework and lowers the provision and quality of public goods and services. The countries included in this study have a shadow economy ranging between 25-35% which is a large number and it is therefore important to have certain policy recommendations which can eventually curtail the size of underground economies in these countries.

Keeping the results of the study in consideration, it can be recommended that countries especially India, Pakistan and Bangladesh can improve the efficiency of their tax system by widening tax base and lowering tax rates. Shadow economy in these countries is large because one party has to bear the tax burden and they move underground in order to escape it. Widening tax base would mean this tax burden would be spread out and more tax payers would curtail the size of underground economy and increase tax revenue which will ultimately benefit their economies. Furthermore, tax collection system should be simple and comprehensive so that common people can understand it. This is likely to lessen the chances of tax evasion. Tax collection units should have staff that is efficient and honest in order to ensure proper tax revenue collection.

The results have also shown that index of economic freedom is a significant determinant of shadow economy in two countries and the relationship between this variable and the size of underground economy is negative for all the countries in the sample. This clearly establishes its importance as one of the crucial factors in reducing the size of the underground economy. It is therefore recommended that better quality institutions need to be in place which ensure that all the laws related to property rights, labor market, businesses, anti-corruption and trade and investment are properly enforced. This would create a favorable environment for businesses to operate in formally and there will be little incentive to move underground.

With regards to internet users and the size of shadow economy, it is recommended that better transparency systems need to be in place and proper monitoring needs to be carried out in order to track any informal activity online. Effective campaigns on honest usage of ICT should be developed and carried out.

It is important to understand that this study provides a base for future studies on shadow economy in developing countries and should be treated as such. Like many other studies, this study also has time and financial limitations that have constrained the study from using other econometric models and from conducting primary research. Alongside, due to ineffective data collection units in the sample countries, many variables especially poverty, literacy levels and tax rates could not be included in the study. Nevertheless, a closer look at the developing countries' shadow economies and making use of their most recent estimates is an addition to the limited literature in this area. The important variables have been found out and discussed and the insignificant variables have been identified for all the countries. The relationships which have been ambiguous to date have also been measured and tested differently to see if any new findings can be obtained. This research can further be developed by including a longer time period and adding more determinants of shadow economy for developing countries. New ways of measuring the same variables and using new models can also be a likely development of this research.

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APPENDICES

Appendix A

The original findings generated from model estimation using Eviews for Bangladesh, India, Pakistan and Turkey are illustrated below:

Dependent Variable: Y
Method: Least Squares
Date: 04/15/17 Time: 18:08
Sample: 2000 2013
Included observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	56.02052	38.80916	1.443487	0.1990
ECONFREE	-1.569758	0.538513	-2.914984	0.0268
GDP	0.862371	1.756630	0.490924	0.6409
INF	1.163319	0.823365	1.412883	0.2074
INTERNET	1.184422	1.794159	0.660155	0.5337
POP	20.07943	11.25297	1.784367	0.1246
TAXREV	2.568642	4.395183	0.584422	0.5802
UNEMP	-0.274461	4.756673	-0.057700	0.9559

R-squared	0.678058	Mean dependent var	39.02643
Adjusted R-squared	0.302460	S.D. dependent var	4.695831
S.E. of regression	3.921906	Akaike info criterion	5.866592
Sum squared resid	92.28806	Schwarz criterion	6.231767
Log likelihood	-33.06614	Hannan-Quinn criter.	5.832788
F-statistic	1.805273	Durbin-Watson stat	1.985010
Prob(F-statistic)	0.244514		

NB: These results are generated for Bangladesh

Dependent Variable: Y
Method: Least Squares
Date: 04/15/17 Time: 19:07
Sample: 2000 2013
Included observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	47.71591	35.44612	1.346153	0.2269
ECONFREE	-0.569662	0.336658	-1.692109	0.1416
GDP	-0.088117	0.141456	-0.622925	0.5563
INF	0.373345	0.173590	2.150736	0.0750
INTERNET	-0.053733	0.233095	-0.230520	0.8253
POP	-0.195896	10.65322	-0.018388	0.9859
TAXREV	0.356343	0.316067	1.127428	0.3026
UNEMP	-0.300128	1.168546	-0.256839	0.8059

R-squared	0.611121	Mean dependent var	21.65357
Adjusted R-squared	0.157430	S.D. dependent var	0.858806
S.E. of regression	0.788312	Akaike info criterion	2.657714
Sum squared resid	3.728615	Schwarz criterion	3.022889
Log likelihood	-10.60400	Hannan-Quinn criter.	2.623910
F-statistic	1.346997	Durbin-Watson stat	2.779798
Prob(F-statistic)	0.366251		

NB: These results are generated for India

Dependent Variable: Y
Method: Least Squares
Date: 04/15/17 Time: 19:50
Sample: 2000 2013
Included observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	28.29728	67.83403	0.417155	0.6911
ECONFREE	-0.526011	0.646620	-0.813478	0.4470
GDP	-0.985646	0.304770	-3.234068	0.0178
INF	-0.106955	0.182994	-0.584470	0.5802
INTERNET	0.396913	0.590266	0.672431	0.5263
POP	10.45869	13.46356	0.776815	0.4668
TAXREV	1.540513	1.030765	1.494535	0.1857
UNEMP	-0.447917	1.777480	-0.251996	0.8095

R-squared	0.868438	Mean dependent var	31.02643
Adjusted R-squared	0.714949	S.D. dependent var	2.843353
S.E. of regression	1.518071	Akaike info criterion	3.968317
Sum squared resid	13.82723	Schwarz criterion	4.333493
Log likelihood	-19.77822	Hannan-Quinn criter.	3.934513
F-statistic	5.657982	Durbin-Watson stat	2.236009
Prob(F-statistic)	0.025395		

NB: These results are generated for Pakistan

Dependent Variable: Y
Method: Least Squares
Date: 04/15/17 Time: 20:50
Sample: 2000 2013
Included observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	68.30317	28.23677	2.418944	0.0519
ECONFREE	-0.608254	0.261414	-2.326785	0.0589
GDP	-0.094418	0.153762	-0.614051	0.5617
INF	0.298708	0.118949	2.511239	0.0458
INTERNET	0.628675	0.219327	2.866388	0.0286
POP	-2.488129	5.724174	-0.434670	0.6790
TAXREV	-1.658918	1.837606	-0.902761	0.4014
UNEMP	1.705059	0.576539	2.957404	0.0254

R-squared	0.876025	Mean dependent var	37.65571
Adjusted R-squared	0.731387	S.D. dependent var	4.173493
S.E. of regression	2.163033	Akaike info criterion	4.676459
Sum squared resid	28.07226	Schwarz criterion	5.041634
Log likelihood	-24.73521	Hannan-Quinn criter.	4.642655
F-statistic	6.056685	Durbin-Watson stat	2.518645
Prob(F-statistic)	0.021583		

NB: These results are generated for Turkey

Appendix B

This part of the appendix shows original tests of heteroscedasticity for the models. White test has been used to test the presence of heteroscedasticity. The results are generated using Eviews.

Heteroskedasticity Test: White

F-statistic	0.223788	Prob. F(7,6)	0.9648
Obs*R-squared	2.898462	Prob. Chi-Square(7)	0.8942
Scaled explained SS	0.265621	Prob. Chi-Square(7)	0.9999

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 04/25/17 Time: 10:42
Sample: 2000 2013
Included observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.42802	53.04038	0.290873	0.7809
ECONFREE^2	-6.67E-05	0.012480	-0.005348	0.9959
GDP^2	0.024907	0.368317	0.067624	0.9483
INF^2	0.093915	0.128672	0.729874	0.4930
INTERNET^2	-0.082179	0.505075	-0.162706	0.8761
POP^2	-0.340376	7.502285	-0.045370	0.9653
TAXREV^2	0.060454	0.605111	0.099905	0.9237
UNEMP^2	-0.884453	1.312854	-0.673688	0.5256

R-squared	0.207033	Mean dependent var	6.592004
Adjusted R-squared	-0.718095	S.D. dependent var	6.833594
S.E. of regression	8.957210	Akaike info criterion	7.518354
Sum squared resid	481.3897	Schwarz criterion	7.883530
Log likelihood	-44.62848	Hannan-Quinn criter.	7.484550
F-statistic	0.223788	Durbin-Watson stat	2.681105
Prob(F-statistic)	0.964762		

NB: These results are generated for Bangladesh

The results above indicate that since prob. Chi-Square is less than the White test statistic, it means heteroscedasticity exists.

Heteroskedasticity Test: White

F-statistic	0.574194	Prob. F(7,6)	0.7579
Obs*R-squared	5.616229	Prob. Chi-Square(7)	0.5852
Scaled explained SS	0.224399	Prob. Chi-Square(7)	1.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 04/25/17 Time: 11:03
Sample: 2000 2013
Included observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.227052	4.054431	1.042576	0.3373
ECONFREE^2	-0.000721	0.000901	-0.799701	0.4544
GDP^2	0.001598	0.002661	0.600726	0.5700
INF^2	-0.002844	0.002593	-1.097074	0.3147
INTERNET^2	-0.000420	0.002056	-0.204187	0.8450
POP^2	-0.748858	0.627540	-1.193323	0.2778
TAXREV^2	-0.004207	0.004070	-1.033516	0.3412
UNEMP^2	0.018291	0.036217	0.505055	0.6315

R-squared	0.401159	Mean dependent var	0.266330
Adjusted R-squared	-0.297488	S.D. dependent var	0.182302
S.E. of regression	0.207655	Akaike info criterion	-0.010315
Sum squared resid	0.258724	Schwarz criterion	0.354861
Log likelihood	8.072203	Hannan-Quinn criter.	-0.044118
F-statistic	0.574194	Durbin-Watson stat	3.164961
Prob(F-statistic)	0.757936		

NB: These results are generated for India

The above results show that heteroscedasticity exists in the model for India.

Heteroskedasticity Test: White

F-statistic	1.016769	Prob. F(7,6)	0.5001
Obs*R-squared	7.596284	Prob. Chi-Square(7)	0.3695
Scaled explained SS	0.898375	Prob. Chi-Square(7)	0.9963

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 04/25/17 Time: 11:08
Sample: 2000 2013
Included observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-33.85526	21.57912	-1.568890	0.1677
ECONFREE^2	0.010058	0.004694	2.142485	0.0759
GDP^2	0.002990	0.024799	0.120564	0.9080
INF^2	0.002835	0.005747	0.493330	0.6393
INTERNET^2	0.049031	0.037525	1.306615	0.2392
POP^2	0.534121	1.654938	0.322744	0.7578
TAXREV^2	-0.064435	0.043882	-1.468372	0.1924
UNEMP^2	0.128996	0.104914	1.229540	0.2649

R-squared	0.542592	Mean dependent var	0.987660
Adjusted R-squared	0.008949	S.D. dependent var	1.163107
S.E. of regression	1.157891	Akaike info criterion	3.426637
Sum squared resid	8.044271	Schwarz criterion	3.791813
Log likelihood	-15.98646	Hannan-Quinn criter.	3.392833
F-statistic	1.016769	Durbin-Watson stat	2.656551
Prob(F-statistic)	0.500084		

NB: These results are generated for Pakistan

Heteroscedasticity exists in this model, too.

Heteroskedasticity Test: White

F-statistic	6.861748	Prob. F(7,6)	0.0159
Obs*R-squared	12.44537	Prob. Chi-Square(7)	0.0868
Scaled explained SS	2.492195	Prob. Chi-Square(7)	0.9277

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 04/25/17 Time: 11:10
Sample: 2000 2013
Included observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-31.82162	11.97305	-2.657770	0.0376
ECONFREE^2	0.001857	0.002329	0.797015	0.4558
GDP^2	-0.057361	0.019645	-2.919921	0.0266
INF^2	0.000197	0.001445	0.136121	0.8962
INTERNET^2	-0.007714	0.003828	-2.015189	0.0905
POP^2	4.728025	1.754063	2.695470	0.0358
TAXREV^2	0.074783	0.033243	2.249596	0.0655
UNEMP^2	0.016311	0.018568	0.878421	0.4135

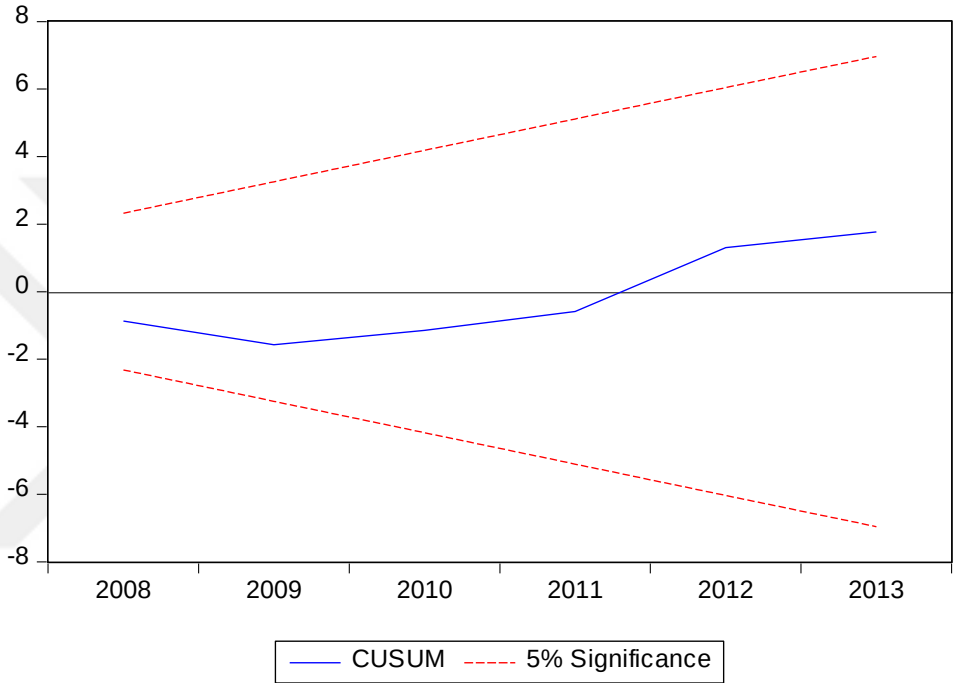
R-squared	0.888955	Mean dependent var	2.005161
Adjusted R-squared	0.759403	S.D. dependent var	3.072703
S.E. of regression	1.507182	Akaike info criterion	3.953920
Sum squared resid	13.62959	Schwarz criterion	4.319096
Log likelihood	-19.67744	Hannan-Quinn criter.	3.920116
F-statistic	6.861748	Durbin-Watson stat	2.391016
Prob(F-statistic)	0.015923		

NB: These results are generated for Turkey

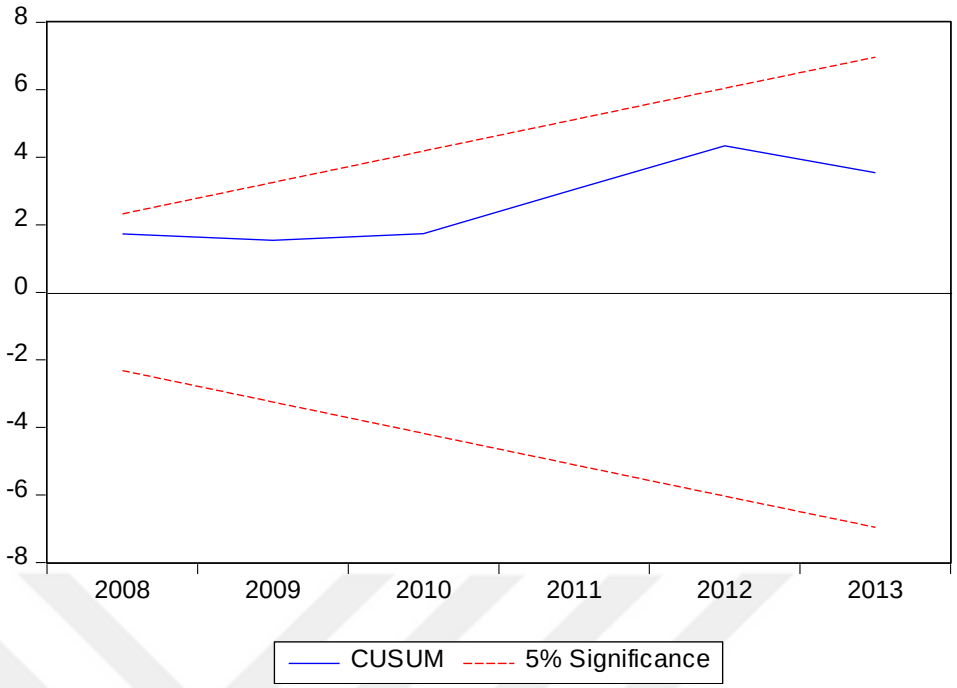
Like all the models, heteroscedasticity also exists in the model for Turkey.

Appendix C

This section of the appendix shows the results of the stability diagnostic tests to check whether the model used in this study is stable. In order to do so, CUSUM test has been used using Eviews and the results are provided for the sample countries at 5% level of significance. If the CUSUM is between the critical line that is suggestive of coefficient stability, it means that the model is stable. The opposite is true when the model is unstable.

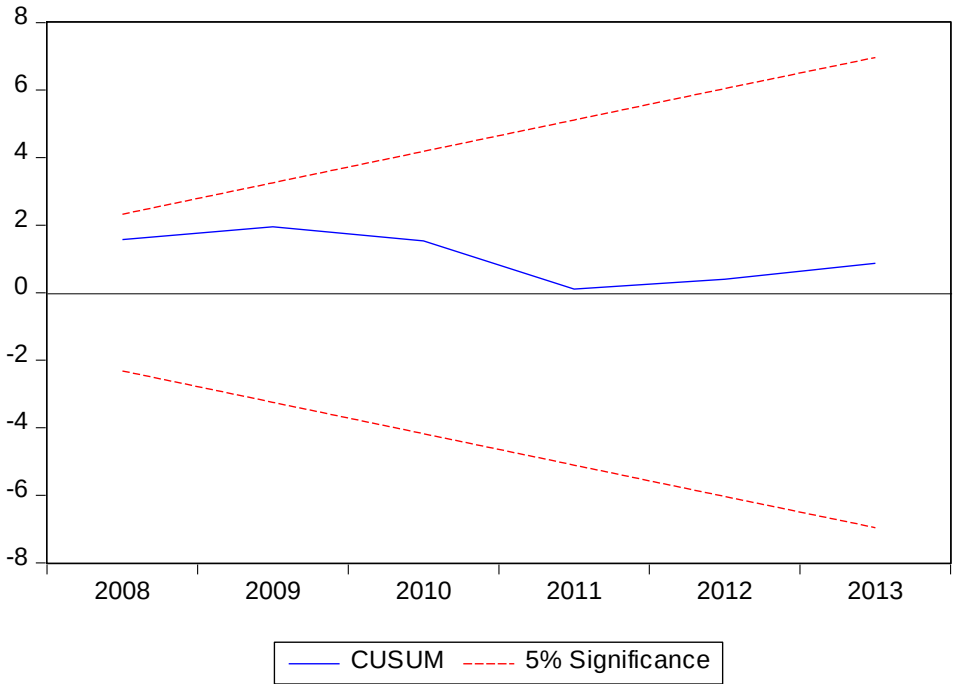


The graph above is generated for Bangladesh. Since the CUSUM is between the critical region and infact, far from the critical region, it indicates that the model is quite stable at 5% significance.

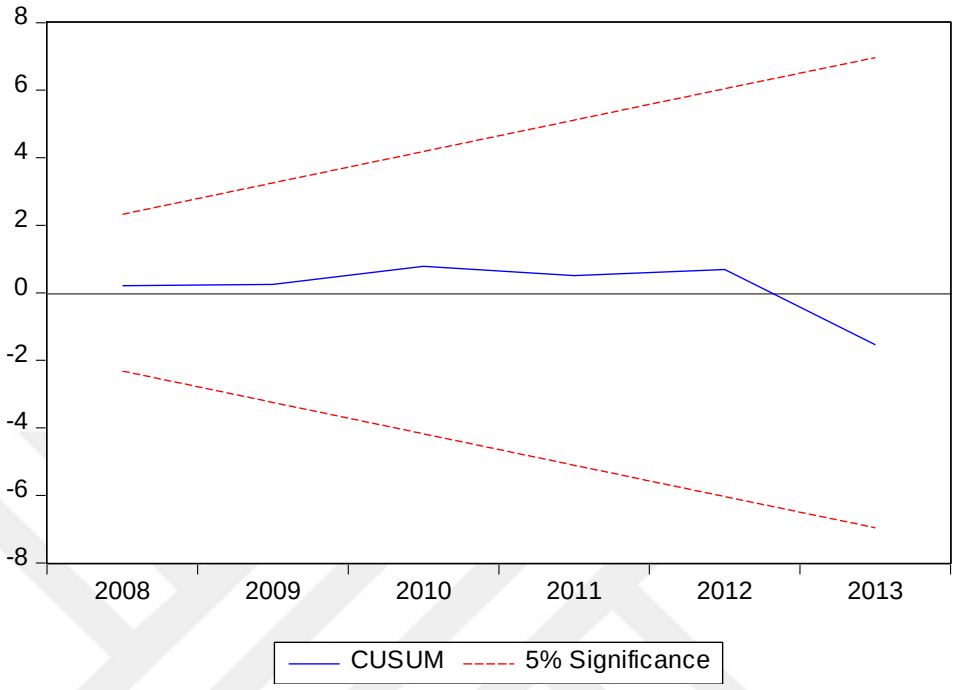


The graph above is for India and the model is stable since it is within the critical region. It can be seen that initially the CUSUM is close to the critical line however with the passage of time, it has moved away from the critical region.

The graph below illustrates the CUSUM stability results for Pakistan. Like India, its CUSUM is also close to the critical region initially but overtime, it moved quite far from the critical line, indicating stability.



The stability test results for Pakistan show that initially, the model was closer to the critical boundary but eventually it moved away and became more stable overtime.



The above graph is generated for Turkey. It can be seen that of all the sample countries, Turkey has the most stable model since the CUSUM is not only within the critical region, it is quite far from the critical boundaries.

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