Research Paper

Impact Assessment of Natural Disasters upon Economic Growth in Pakistan

Umair Shahzad

Research Paper submitted to the faculty of Lahore School of Economics in Partial Fulfillsments of the Requirements for B.Sc Degree in Economics and Social Sciences

Research Supervisor: Syed Toqueer Akhtar

Lahore School of Economics

April 2014
ABSTRACT

The research is based on the natural disasters in Pakistan, and their overall impact on the economy of Pakistan. Disasters are hypothesized to have a significant effect on the GDP of Pakistan. Moreover, Pakistan is considered as a disaster prone nation due to its geographical location. Pakistan has always been likely to be affected because of floods due to monsoon rains. But looking at the recent history, Pakistan has experienced massive loss due to 2010 floods and due to the earthquake in 2005, these two being considered as the biggest disasters in Pakistan of all time.

The Time-series Distributive Lag (DL) model has been used to find the model estimates. Number of people killed in disasters is taken as a proxy for disasters and it effect on economy is seen. Interaction of glacier meltdown with consumption of ozone depleting substances has been developed and is seen as a proxy cause for global warming, which ultimately results in climate change and is likely to cause natural disasters. The results suggest that natural disasters and global warming have a negative impact on the economic growth. Moreover the study focuses on the policy implications from National Disaster Management Authority (NDMA) and to avoid huge losses with better mitigation plans has been incorporated and suggestions in conclusion that how can the losses from disasters be minimized.

Keywords: Disaster, Global Warming, GDP, Disaster Risk Management.
Contents

PART I- INTRODUCTION ............................................................................................................. 3

1.1. An Overview of Severity and Frequency of Disasters in Pakistan ......................... 3
1.2. Environmental degradation, Global Warming and Disasters.................................... 4
1.3. Estimates of Damages: Limitations and Constraints .............................................. 4
1.4. Socio-Political and Economic outcomes of disasters............................................. 5
1.5. Study Objectives .......................................................................................................... 5

PART II- PROPOSED FRAMEWORK OF ANALYSIS, REVIEW OF LITERATURE AND MODEL BUILDING PREFERENCES ............................................................. 6

2.1. The Economic downturn caused by Natural Disasters ........................................... 6
2.2. Importance of Developmental Aid to Assure Economic Growth ......................... 8
2.3. Remittances from Abroad: Increasing the household budget and helping making lives better ................................................................................................................. 10
2.4. Role of Media in Disaster Marketing and Disaster Response ............................. 11
2.5. Political Stability: Developmental performance and Efficient Management ....... 12
2.6. Global Warming: Risk assessment of Ozone Depletion and Glacier Melting Causing Climatic Upsets ......................................................................................... 14
2.7. Statement of Research Hypothesis ....................................................................... 15
2.8. Elements of Research Design and Data Collection Preferences ....................... 15
2.9. Statement of Analytical Approach and Methodology ........................................ 16

PART III- ESTIMATION, ANALYSIS AND CONCLUSION ....................................................... 18

3.1. Estimated Results ....................................................................................................... 18
3.2. Analysis of Findings ................................................................................................. 18
3.2.1. Disasters and Economic Growth ........................................................................ 19
3.3. Conclusion .............................................................................................................. 20
3.4. Policy guidelines and policy recommendations ..................................................... 21
3.5. Limitations of the study ......................................................................................... 21

References ......................................................................................................................... 22
Appendix ............................................................................................................................ 25
PART I- INTRODUCTION

1.1. An Overview of Severity and Frequency of Disasters in Pakistan

In order to measure the economic growth, the macro-economic indicators are used to develop individual relationship with GDP. For Pakistan just like all other countries all such indicators are used to see how the performance of economy is aided by these indicators. But another factor that can be very relevant in case of Pakistan is the impact or results of natural disasters\(^1\) on the economy of Pakistan. As Pakistan is regarded as a disaster prone country due to its geographical positioning, and every year Pakistan has to suffer huge economic and human capital losses, which in return transmits a massive impact on the economic growth.

According to statistics of EM-DAT\(^2\) the loss of human capital and the number of people affected by these natural disasters in Pakistan is massive. That straight away indicates the existence of economic damages which hinders sustainable growth. This frequent encounter with natural disasters increases Pakistan’s dependence for economic development on; developmental aid, remittances from abroad, stability and efficiency of government, the role of media and global warming.

GDP has been used as dependent variable which shows the performance of the economy with respect to all the independent variables. As mentioned earlier that no. of people killed in disasters has been taken as proxy variable to determine the influence of disasters. Development aid shows the inflows into the country for initiating infrastructure development and reconstruction of lost resources, which could be further used to encourage

\(^1\) Disaster: “An occurrence of loss in form of human, capital, economic or environmental category and effects the society and development”.\(^1\) [Source: UN/ISDR 2007]\n
In order to declare any natural mishap as a disaster and to record it in the database of the UN's International Strategy for Disaster Reduction (ISDR), any of the mentioned conditions must be met:

- An even causing the death of 10 or more people
- A event affecting 100 people
- Government announcing the state of emergency in response the disaster
- Involvement of International assistance desired by National government

\(^2\) EM-DAT is publically accessed International Disaster Database for disaster statistics.
education resulting in awareness. Remittances from abroad are seen as an invisible hand that supports the household circle. Media shows the awareness spread and lastly, global warming\(^3\) for which an interaction term of consumption of ozone depleting substances and glacier mass has been developed to see the impact on economy.

1.2. Environmental degradation, Global Warming and Disasters

Global Warming is an alarming issue for the whole world and protocols; Montreal in 1987 and Kyoto in 1997 have been signed by countries to reduce the greenhouse emissions as the ozone layer has been depleting due to these extensive amount of emissions in the atmosphere, especially due to industrialization. This depletion has resulted due to massive use of CFC’s\(^4\) by developing counties and if the ratifying countries abide by the protocol, the ozone while is expected to shrink by year 2050.\(^5\) But global warming has caused drastic climate changes causing extreme changes in temperature resulting in rapid increase of natural disaster. Factors like deforestation have very badly influenced the natural habitat and have increased the risk of damages caused due to natural disasters.

1.3. Estimates of Damages: Limitations and Constraints

Disasters are due to cause damages in form of lives lost and economic losses. In a country like Pakistan where there is weak infrastructure and extreme lack of awareness to manage or sustain a disaster situation, the damages are always very high as compared to any other country facing the same disaster of the same magnitude.

Moreover Pakistan is also classified as disaster prone nation due to its geographical setting. The estimates of damages can be calculated by the loss of productive human capital killed in the natural disasters and the loss of productive land that includes agricultural land, factories, schools and other department which were being productive to the economy. There can be certain limitations and constraints in estimating the true cost of a disaster, which can

\(3\) Global Warming: “The global increase in the Earth’s temperature causing melting of glaciers, depletion of ozone layer and effecting the natural habitat.” [Source: EPA]\(^3\)

\(4\) Chlorofluorocarbons

\(5\) Speth(2005) discusses the global environment crises in his article “Red Sky at Morning: America and the Crises of the Global Environment.”
result due to lack of access to the areas where the disaster has struck and no proper organizational setup to estimate the economic losses. The real damages are assessed by the economic performance of the areas affected due to disasters when they are compared to their previous year performances.

1.4. Socio-Political and Economic outcomes of disasters

Disasters leave a dent on the progress of economy and on the minds of individuals who suffer due to lives lost of their relatives and financial losses just because of Mother Nature. In the times of disasters the well doing society has always stepped up to help the affected ones in form of huge fund raising rallies, large private setups for donations in form of cash, first aid equipment, clothes, tents and any possible help that can be gathered. People abroad have also been witnessed participating actively to help the cause.

Economy, as discussed before as well is due to be badly influenced by the disaster. The momentum is disturbed as the infrastructure is damaged and the productive land is ruined. Hence political up rise and stability of political departments to manage such situations efficiently is very important, because the better the performance on behalf of government is going to be the better the outcome will be.

1.5. Study Objectives

The study aims to find out how disasters effect the growth of the Pakistan economy significantly, alongside other determinants included as part of the defining equation. The research is very relevant with respect to the current and previous breakdowns the economy has suffered due to frequent occurrence of disasters. Once the desired hypothesis is proved, the study will look into policy implications and framework of NDMA\(^6\), which can help in making disaster management efficient and reducing the magnitude of damages in Pakistan. Substantial amount of literature is evaluated to support the relationship of all variables used in the model.

---

\(^6\) National Disaster Management Authority
Focuses is laid on the relationship between disaster and economic growth, which theoretically and precisely has a negative relationship. As disaster damage hinders and results in sluggish economic growth. So the study will show that how disasters and other related variables will affect GDP\(^7\), and how the policies from NDMA can be improved in order to reduce the disaster damages.

**PART II- PROPOSED FRAMEWORK OF ANALYSIS, REVIEW OF LITERATURE AND MODEL BUILDING PREFERENCES**

After consulting the literature review and considering the theme of the topic, various relevant independent variables have been used to perform regression and comply with the aims of the proposed study. In order to test the hypothesis, Distributive Lag Model has been used as part of the Time-Series analysis. For which GDP is taken as the dependent variable and no. of people killed in disasters; which has been used a proxy for disasters, Global warming; by developing an interaction between ozone depletion and glacier mass, foreign remittance, development aid, political stability and media are used as independent variables.

**2.1. The Economic downturn caused by Natural Disasters**

Long (1978), discusses impact and influence of disasters in the third world countries. Natural disaster have always had an increasing trend in the history for developing countries in Asia and these Asian economies are mostly dependent on their agricultural sector, which acts as a main source of economic activity. Growth of these economies is adversely affected due to their high dependence on agriculture sector as all the developing economies are disaster prone. Monsoon rains causing floods of 1974 in Bangladesh hindered economic development massively, as the economic losses amounted to US$580 million. As disasters have experienced an increasing trend over the period of time so for that reason planning aspects have been highlighted, including few important ones like; sensitivity analysis,

---

\(^7\) Gross Domestic Product: “The total value of goods and services produces in a country in a year, which is held equal to the total consumption, investment and spending by the government, added to the value of exports minus imports.” [Source: Investorwords.com]
forecasting techniques, community participation and a system that incorporates proper implementation of disaster mitigation projects.\(^8\)

Brancati (2007), disasters i.e. floods and earthquakes can lead to intrastate conflicts as the resources; food, relief, aid, housing and medicine are limited for survival and this can move on to affect the GDP of the country as the case of earthquakes in Kashmir in 2005 have been primarily focused. As densely populated areas are the ones which are highly affected in terms of lives lost and revenue generation as well. A relationship has been developed in a way that disasters are seen as promoting the intrastate conflict, which later aids to certain factors and affects GDP adversely.\(^9\)

Stromberg (2007), Study focuses on the losses from disasters from 1980-2004 and they have amounted to $1 trillion just in terms of economic losses. Disasters primarily focus on two aspects; one being economic losses and other being the loss of human capital. The productive capital is in form of human minds and productive land, which when lost is counted as the biggest damages and affects the growth of the economy. Impact of disasters on real income is also seen to be adversely affected as the development process featuring growth of damaged resources is gradual and takes place over the period of time. Drastic climate changes have been discussed to support the fact that disaster are increasing in numbers and are directly related to the climatic changes.\(^{10}\)

Kahn (2005) focuses on disasters in 73 counties across the globe during 1980-2002. Developed or rich countries are seen to experience same number of disasters as the poor countries but the differences are in the loss of human lives as the suffer with less deaths resulting from disasters. Natural disasters seem to affect different sectors of the economy, from growth rates to the prices if natural resources. The fact acknowledged here is that both the rich and poor nations experience same amount and quality of shocks but the reason due to which there is less loss of human capital in rich countries is higher GDP per capita. Which

\(^8\) See Long(1978)  
\(^9\) Brancati(2007)  
\(^{10}\) See Stomberg(2007) – disasters have a negative impact on GDP as the loss is in form of human capital and productive land.
reflects the institutional efficiency and better governance acting as shield to protect the locals and keep them aware of the situation by performing their assigned roles.\textsuperscript{11}

2.2. Importance of Developmental Aid to Assure Economic Growth

Quazi (2005), Foreign aid and loans have significant impact on the GDP growth. Although foreign aid and development assistance plays a vital role in nourishing any economy and providing a base to establish itself, but primarily the focus should be intended on efficient usage of domestic resources. Emphasis has been laid on the aid growth model for developing economies where a distinction has been made between foreign loans which are seen as beneficial for the economic growth and foreign grants on the other hand are found to be comparatively non-productive.\textsuperscript{12}

Islam (2003), States that there is no theory which is compelling enough to signify or develop a unique pattern for describing a relation between aid and growth. Effectiveness of foreign aid for GDP growth has been identified by looking at the type of government. Effectiveness is tested using a cross section and time-series pooled data for eleven Asian and twenty-one African countries. Aid varies with the type of political regime, but is always seen to be having a positive impact on the growth rate. Reduction in infant mortality rates and improvement in public health services can very well be supported by efficient use of developmental aid. Specific targets are defined to be aided after receiving the Official Development Assistance (ODA) and that varies with type of political regime.\textsuperscript{13}

Shirazi, T.A (2009), focuses on how foreign aid has influenced human development in Pakistan and supports the fact that Pakistan just like other developing and capital scarce countries heavily relies on the foreign aid to support the development issue, damages, and trade and investment gaps. Developmental Aid has always boosted social welfare and that ultimately results in the economic growth. Removal of diseases like malaria and HIV/Aids along with alleviation of poverty and hunger are to be catered under the agenda and scope of Millennium Development Goals (MDGs). Influence of aid on Social development Indicators

\textsuperscript{11} See kahn(2005)
\textsuperscript{12} Quazi (2005) – Aid is seen as having significant impact on GDP growth using Error correction model based on cointegration method
\textsuperscript{13} Islam(2003)
is also positive. Another finding has been discussed that the ODA helps alleviating poverty and aids development but does not necessarily increase economic growth.\textsuperscript{14}

Khan and Ali (1994), Money and aid assistance has helped human resource development by making the residents healthier and well educated. In 1950’s Pakistan initially sustained on grants from its anti-communist allies. United States has always acted as the biggest source of foreign aid to Pakistan. Contribution of aid is seen toward the social sector of the economy. Rural Development programs funded by aid including development of hospitals and child health care centers for managing disaster related upsets. Development Projects funded by foreign aid help generating employment prospects. The main finding comprises of the fact that aid rich countries are mostly givingaid to poor country not for their development or alleviation of poverty, but to fulfill their self-interest. Donor Countries need to side line their self-interest and should actually play a supporting role for the poor countries. The received aid should be wisely spent on the education and infrastructure development.\textsuperscript{15}

Mahmood (1997) discusses the positives and negatives of foreign aid keeping in view the economy of Pakistan. The positives include the transformation of the economic structure, developing the infrastructure, laying basis for industrial and agricultural sectors and funding for the projects to reduce the damages from disasters and introducing social sector development. The negatives were based on mismanagement and underutilization, and the losses occurring due to these hindered the economic growth. The study shows the overall impact of the aid received to Pakistan has been positively related to its growth rate. The policies of lenders matter a lot to pursue development that results due to aid being injected into the right and key functional areas of the economy to expect higher returns which could be accounted for GDP growth. Political and economic interests are very much related to one another.\textsuperscript{16}

\textsuperscript{14} Shirazi, Mannap and Ali(2009)- Using Vector Error Correction Model
\textsuperscript{15} Khan and Ali (1994)
\textsuperscript{16} Mahmood(1997)
2.3. Remittances from Abroad: Increasing the household budget and helping making lives better

Arnold (1986) says that remittances play an imperative role in the development and help carrying out daily expenditures for households. The study estimates the usage of remittances in rural sectors. As mentioned in the study that rural households use 43% of the received remittances on the house improvement and around 40% is used on food and clothing. Remittances are seen to be fulfilling the need for necessities of education and nutrition, which further lead to better living. Remits from abroad are seen to be having a proportionate impact on investments, which gradually leads to economic development. Income of households are very much aided by the money received from abroad, helping them move their circle. Prime focus has been led on economic development despite the fact that productive labor has left the country. It is seen that the dependence of households on remittances from abroad have increased a lot.17

Brown (2006) finds out remittances being counter-cyclical and the welfare impact is estimated. Moreover there is a safety net for households created due to remittances, as they are not burdened with any kind of debt or loans to incur the expenditure. Transfer of private funds by the Pakistani labor in Gulf has to their families in villages has helped them to develop and globalize. The concept of Brain-Drain or gain has been introduced to see the effectiveness of remittances, and has varied from country to country depending on the potential job opportunities. Remittances can be utilized to pursue sustainable development and government policies can play an important role that encourage more inflows of money from labor abroad, which can provide them better investment outcomes.18

Bilgrami (1991) discusses the positive impact of remittances on the economy of Pakistan for two different time periods of 1959-60 and 1987-88. The findings state that if one million increases in remittances is accompanied by a 2.43 million increase in GNP. Pakistan experienced a massive outflow of human capital during 1970’s and 1980’s but this outflow was aided by the inflow of remittances. Macroeconomic Keynesian model has been used to see the impact of remittances on the development process. Positive change in

---
17 Arnold(1986)
18 Brown(2006)
consumption patterns is seen along with increasing trend in investment is aided by remittances. Further the incidence of poverty is removed and households receiving remittances are helped in times of need through their sources remitting them the money.\textsuperscript{19}

Quinn (2009) discusses that how migration and remittances result in development, and the development discussed here is in the agriculture sector by introducing better technology. Remittances encourage the use of High Yielding Varieties (HYVs\textsuperscript{20}) and help eliminating the household risk along with credit constraints. The study focuses on the investment in the agricultural technology by using HYVs from the received remittances can result in better output and growth. Even incase of disaster affecting the crops or any crop failure and with the absence of labor, the remittances compensate for all these issues. Liquidity problems and risk constraints are very well catered by the remittances and it also helps formulating the investment decisions for the risk averse household, hence leaving a positive impact on the economic growth. If sufficient amount of remittances are received it can lead to sustainable development.\textsuperscript{21}

Jahjah (2005) proposes that remittances play an equal part in economic development just like capital inflow and foreign direct investment. The hypothesis developed here is that as remittances are seen to be non-profit oriented in contrast to foreign direct investment so they result in having a negative relation with growth of GDP. Remittances are seen to be aiding the households or individuals for the bad economic outcomes in form of recession or unfavorable situations during disasters. They are seen as having a negative correlation with economic growth as the nature through which they are determined in compensatory for unfavorable situations.\textsuperscript{22}

2.4. Role of Media in Disaster Marketing and Disaster Response

Afzal (2007) sees the impact of factors encouraging globalization on the economic development. Globalization is aided by transfer of technology and knowledge through trade liberalization and development in the field of electronic media. The impact of media and

\textsuperscript{19} Bilgrami (1991)
\textsuperscript{20} High Yielding Varieties – The agricultural products
\textsuperscript{21} Quinn(2009) – 2SLS and 3SLS approaches have been used to see the effect of migration and remittances on the development in agriculture, depicting growth.
\textsuperscript{22} Jahjah(2005) – defining remittances as compensation for unfavorable economic situations.
globalization, when aided by trade openness and resource mobilization has no significant impact in the short run. Pakistan had a very narrow economy during the period of 1950’s till 1980’s, but after that economy started to open up and globalized resulting in growth.\(^{23}\)

Hetherington (1996) focuses on the finding that how media spreads the overall image of a certain activity is it economic or social and leaves an impact on people. The prime finding is how media powers the outcome of certain ongoing process by transmitting positive image out of it which can lead to positive outcomes. As discussed is the case of George Bush’s defeat in year 1992 and how media played a role in setting the outcome. The study estimated the influence of media on the considered outcomes for which two model have been applied to see the findings. The way media is going to shape up the image about the economy of any particular country and the way it shapes the issues being considered; positively or negatively, in the same way the influence on the economy will be considered. Media is considered to have indirect effects on the economic outcomes of a certain decision or an ongoing process.\(^{24}\)

\section*{2.5. Political Stability: Developmental performance and Efficient Management}

Goldsmith (1987) sees political stability as an independent variable which is very likely to affect other socioeconomic issues leading to development. Stability in any sector of economy is considered to be beneficial for the economic and social growth along with affluence. No violence, tenure of the ruling government and limited structural change are seen as some indicators of political stability. The indicators of political stability have been used in relevance to the situation of underdeveloped countries; The Oslon’s hypothesis has been used for establishing the relationship between political stability and economic growth. Political stability along with all other variables related to it are seen to have a significant effect on the economic development. The variables that are seen to be correlating with political stability and are expected to have a similar role in development; are efficient performance of institutions, level of technology and human capital along with openness to trade.\(^{25}\)

\[^{23}\text{Afzal(2007)}\]
\[^{24}\text{Hetherington(1996)}\]
\[^{25}\text{Goldsmith(1987)}\]
Ghani (2005), discusses the measures of governance by using six different indicators including; rule of law, corruption level, quality of regulatory body, political stability, effectiveness of government and level of accountability. Human development, Governance and Globalization have been discussed in this study to see the impact on the development. The study proves the hypothesis that in order to enjoy benefits of globalization and experience growth of the economy, it is really important to have good governance, which means all the six indicators measuring governance should be performing.26

Hasan (2007), talks about the political will and the role played by the state in either hindering or speeding up the development. Pakistan’s performance over the last 60 years been focused along with quality of governance, resource mobilization in scope of the state provided directions. Pakistan’s development approach has been compared with China, Korea and Malaysia, and that seems very out of focus. Political Stability and sustainable growth both require a sound background relying on efficient growth distributions to look for the same results in future too. Extended expenditure on defense needs to be governed and money should be used for development to have a set platform to meet with future challenges.27

Rashida Haq(2006), sees governance having positive impact on the economic growth. If the substantial amount of governance is not found the results will lead to rise in poverty and will slow down the rate of growth. Improvement in infrastructure and strong educational base results in economic development, if it is facilitated by good governance and stable political environment. Governance is divided into three categories; Political, Economic and Institutional. The study is based on OLS estimation to see the linkage between political stability and effective governance in Pakistan on the development and growth of poor during the time period 1996-2005. The results show that weak governance and lack of efficiency among the political institutions discourage long term investment and hinders sustainable growth. Measures need to be taken to alleviate poverty and pursue good development till 2015.28

26 Ghani(2005)  
27 Hasan(2007)  
2.6. Global Warming: Risk assessment of Ozone Depletion and Glacier Melting Causing Climatic Upsets

Grove (1987), talks about the rise in temperature resulting due to carbon dioxide emissions, which is causing sea levels to rise and melting the glaciers and Antarctic ice sheet. Glaciers are very sensitive to climatic changes and climate does vary a lot. Due to this reason glaciers are seen to be shrinking. Global sea levels are predicted to increase during the 21st century as the temperature is due to increase by 2°-4°C. Small glaciers are expected to melt completely resulting an increase in global sea level by 0.6m. Carbon dioxide is stated to have increased by 25% as compared to the time when there was no industrialization. Hence greenhouse gases like nitrous oxide and methane are found on a massive scale in the atmosphere. The low-lying coastal areas are expected to be much effected as the Global sea levels are due to rise by approximately 1 meter and this can prove to be disastrous.29

Swanson (2003) estimates the relationship between Chlorofluorocarbons emissions and income per capita. A relationship has been developed to see whether massive emission of CFC’s also insuring an increase in the production levels globally. The Montreal protocols net benefits have not been seen as substantial enough to reduce the CFC’s emission. 41% reduction in the CFC’s emissions was seen from the countries not approving the protocol. Whereas the reduction in emissions was nearing 45% for developing countries. As the study focuses on the CFC’s emission and the income per capita contributing to GDP, the results are seen to incomplete and not proving the set hypothesis and agrees to the fact that the set protocols have just set co-operative barriers for the countries and nothing else.30

Lujala (2012) sees how global warming causes floods, cyclones and other natural disasters and econometric approach has been used to see the effects of natural disasters in the economic growth. The findings of the study show that natural disasters have an adverse impact on the economic development and the impact is considered to be influential enough as well. Climate changes occurring more frequently will result in massive natural disasters. Pakistan’s economic damage has been very huge due to natural disasters resulting due to climatic changes. The impacts are found to be completely negative and unproductive.

29 Grove(1987)
30 Swanson (2003)
Number of people killed in disasters measure the intensity of economic damage that is seen on GDP. The research hypothesis is proved by findings as the floods and earthquakes are resulting in huge economic losses in form of crop washout, human lives lost and infrastructure damage.  

Memon (2012) talks about the threats arising from climatic changes which have caused an increase in unpredictable disasters, floods of 2010 are specially being highlighted. Poor infrastructure and unplanned human settlements are seen to be maximizing the loss from natural disasters. The root causes of floods to be considered are drastic changes in climate and deforestation. The average rainfall is increasing with passage of time. The paper further focuses how disasters can be dealt with and infrastructure can be rebuilt in a way that it minimizes the damages occurring from disasters. The paper further focuses on how the management of disasters through cooperation of NDMA can be done.  

2.7. Statement of Research Hypothesis

The research hypothesis in contrast to the aim of the study is defined as:

\[ H_0 : \text{Natural Disasters do not have a negative impact on the economic growth} \]

\[ H_A : \text{Natural Disasters have a negative impact on the economic growth} \]

2.8. Elements of Research Design and Data Collection Preferences

The study uses Time-series data for the time period 1984-2012. The research focuses on how increase in number of disasters and rise in their magnitude is effecting the economy of Pakistan. Research also supports and justifies findings of other related researches in the related field. Research has been designed in a way so that the impacts can be assessed over the years and proper policy measures can be defined to ensure fewer losses in future.

---

31 Lujala (2012)
32 Naseer Memon- Climate Change and Natural Disasters in Pakistan
All the data collected to perform this study is completely secondary. As data is collected from internationally recognized databases with complete availability of reliable data. Data on No. of people killed in disasters has been taken from the CRED network’s EM-DAT\textsuperscript{33}, which is the disaster database. Data for Developmental Aid, Remittances, Consumption of ozone depleting substances and Glacier mass reduction has been used collected form the World Development Indicators\textsuperscript{34} database. Data on Government Stability has been used from ICRG\textsuperscript{35} and data on Media has been extracted from Pakistan’s Statistical Yearbook. Quantification of Variables is listed as under:

\begin{align*}
\text{Killed} & = \text{Number of people who died due to disasters} \\
\text{Ozonglac} & = \text{Interaction term has been developed between consumption of ozone depleting substances which is total in number and the change is glacier mass, for which the cumulative mean has been taken.} \\
\text{Remittances} & = \text{Total amount inflows from abroad by working population in US$.} \\
\text{Aid} & = \text{the log of total development aid in US$.} \\
\text{PoliticalStab} & = \text{Index from 0 to 12, ‘0’ very high risk.} \\
\text{Media} & = \text{Index used from Pakistan statistical yearbook.}
\end{align*}

**2.9. Statement of Analytical Approach and Methodology**

A distributed-lag model has been used for the time-series data in this study. A DL model helps to regress the dependent variable of the current time period, in accordance to the value of previous years; lags of its independent variables. Lags are considered as a substantial part of the time-series approach. The variables are lagged accordingly to check the impact and significance on the dependent variable. As one or more explanatory\textsuperscript{36} variables are lagged, the model becomes multivariate\textsuperscript{37} distributed lag model. The lag number taken to keep the variables is two; hence they are lagged for two time periods.

\textsuperscript{33} EM-DAT is publically accessed International Disaster Database for disaster statistics.  
\textsuperscript{34} World Banks development Indicators database.  
\textsuperscript{35} The PRS Group’s International Country Risk Guide  
\textsuperscript{36} Explanatory variables are , variable explain the effect or the independent variables.  
\textsuperscript{37} Multivariate – the model becomes multivariate as there is more than one dependent variable.
Where as in case of aid its different. All the variables used are quantified properly and for the collection of data, authentic databases have been consulted and relied upon.

Distributive lag model has been used for the mathematical derivation, the optimal lag taken is lag 2 for all the independent variables and for aid lag has also been shown for the previous time period.

\[ GDP_t = \beta_0 + \beta_1killed_{t-i} + \beta_2politicalstab_{t-j} + \beta_3remittances_{t-k} + \log\beta_4aid_t + \log\beta_5aid_{t-f} + \beta_6mediat_l + \beta_7ozonglac_{t-m} + e \]
PART III- ESTIMATION, ANALYSIS AND CONCLUSION

3.1. Estimated Results

<table>
<thead>
<tr>
<th>Dependent Variable: GDP</th>
<th>Coefficient (Standard Error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of people killed in Disasters</td>
<td>-0.00000238*** (0.00000116)</td>
</tr>
<tr>
<td>Political Stability</td>
<td>0.0247829* (0.0063941)</td>
</tr>
<tr>
<td>Remittances</td>
<td>0.000000000106* (0.0000000000220)</td>
</tr>
<tr>
<td>Aid (t)</td>
<td>0.5013086* (0.1023684)</td>
</tr>
<tr>
<td>Aid (t-1)</td>
<td>0.4880529* (0.0835865)</td>
</tr>
<tr>
<td>Media</td>
<td>0.0000183 (0.0000158)</td>
</tr>
<tr>
<td>Ozone Depletion and Glacier Meltdown (Global Warming)</td>
<td>-0.00000000000642* (0.00000000000110)</td>
</tr>
<tr>
<td>Cons</td>
<td>1.718952 (1.08439)</td>
</tr>
<tr>
<td>R-Square</td>
<td>94.9 %</td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>93.15 %</td>
</tr>
</tbody>
</table>

*Significant at 1%, **Significant at 5%, ***Significant at 10%

3.2. Analysis of Findings

The Model has been regressed using the Distributed Lag model. Disasters are seen to be significant at 10% significance level, Global Warming; the interaction of ozone depletion and glacier mass, Political Stability, Developmental Aid are seen to be significant at 1%
significance level and media is seen to be insignificant. The value of R-square is 95% which means that the variation caused by all the independent variables in GDP is 95%.

3.2.1. Disasters and Economic Growth

Disasters are significant at 10% level of significance. Which means an occurrence of disaster will affect GDP negative and will result in its decrease by US$2.38×10^6. As disasters are damaging and result in the loss of human capital and infrastructure damages and substantial literature has been used to prove that, hence disasters always result as barrier to achieve better growth. The productive land and functional industries along with productive labor is damage and displace.

Political Stability is found to be significant 1% significance level, showing that a unit increase in the index will result in an increase in GDP by US$ 0.25. Political stability is always important for a strong growing economy. Political stability will result in fewer uncertainties and will brighten the growth prospects. It also indicates the efficiency of government related institutions, representing their dedication to fulfill their roles for the betterment of the country.

Remittances are significant at 1% significance level stating that a $1 increase in remittances will increase the GDP by US$ 1.06×10^{10}. Remittances from abroad are always seen to be invisible hand helping the households receiving and making a good use of it, either by increasing their consumption or in most cases resulting in investment in the country in form of property purchases and investment on education.

Developmental Aid is seen to be significant at 1% significance level, Aid in both time periods is seen to be significant where in current time period a $1 in increase in aid will increase GDP by US$ 0.5 and the previous time period a $1 increase in aid would have increased the GDP by US$ 0.48. Aid is always a booster for the economy and helps it to develop. As huge funds are received just to pursue development and different projects are initiated that result in the growth. As more opportunities for education and jobs are created. Infrastructure is strengthened, health facilities are improved and the process of development is very well supported by aid and results in increase in the Gross Domestic Product.
The impact of Media is seen to be insignificant. A unit increase in the media index will increase the GDP by US$ 0.0000183. Media is not a successful indicator that helps the growth of the economy, and results of regression support this reasoning. For a country like Pakistan, where there is so much economic uncertainty, political instability and openness to terrorism and disasters, Media has nothing else to cover except these negative issues. Hence media does not play a vital role and to some extend tourism and investment is discourage due to this reason that makes GDP growth very slow and inconsiderable as compared to other determinants.

Impact of the interaction term developed for ozone depletion and glacier melting is significant at 1% significance level as an increase in amount of ozone depleting substances and glacier mass melting will result in decrease in GDP by US$ 6.42×10^{12}. Global Warming is world debate and prior issue of concern. Global Warming results in severe changes in climate which results in floods due to high rainfalls and glacier melting accompanied by the weakening of the ozone layer. Floods and earthquakes as part of natural disasters cause loss of human lives and damage of infrastructure, that as already mention has a negative impact on GDP.

3.3. Conclusion

The aim of study was intended to see whether the impact of disasters in Pakistan is significant and strong enough to have damaging effect on the economic growth. Lagged values were used through distributed lag model to see the impact of all variables in current time period and developmental aid in current and previous time period, which also came out to be significant and acted as a major contributor in the GDP growth. For a country like Pakistan which is so geographically prone to disasters with such unplanned infrastructure has to heavily rely on the foreign aid. Hence, foreign aid helps to develop the economy and makeup for the losses occurred due to disasters and to be pre prepared to minimize the magnitude of loss.

The in depth review of literature supports the results of the variables and hypothesis of the study. Where extensive literature supports the findings of the proposed study. National Disaster and management Authority has make better policies and has to improve the quality of early warning system in order to make disaster management better. The model analysis
show the significance of all the variables except media for which reasoning has been given in the model estimates.

3.4. Policy guidelines and policy recommendations

Considering Pakistan’s openness to disasters, there are few policies that can be applied and followed in order to manage the disaster risk reduction and limit its negative impacts on the economy. Structural Development can play a really important role, as the development of schools and hospitals will help the general public staying safe in the times of disasters. Efficient early warning system should be used to issue timely warnings so that the high risk areas are evacuated to minimize the loss human capital. As the climate is changing so quickly, establishment of coastal facilities is very important and enhance the knowledge of disaster risk management\(^{38}\) among the general public (NDMA, 2012)\(^{39}\).

The standards need to be set in order to pursue any kind of construction and set codes should be followed so that the risk of building collapse is reduced and it has that capability to bear the magnitude of disaster. As Pakistan receives big floods on regular basis, construction of new dams and management of old ones can play a huge role in controlling the excessive flow of water and most importantly the emergency response teams and proper rescue equipment should be readily available at the strategic location, which are more likely to be struck by any natural disaster as based on the past experiences.

3.5. Limitations of the study

There was lack of literature on media that could show or signify its impact on the economy.

\(^{38}\) Disaster Risk Management: “The process engaging the organizations and their operational skills to capacities incorporate the strategies and guidelines to minimize the occurrence of any possibility of loss from of disaster.” [Source: UN/ISDR 2007]

\(^{39}\) NDMA Framework, 2012
References


Memon, N. (June., 2012). Climate change and Natural Disaster in Pakistan.


### Appendix

```
. regress nomgdp L(2). killed L(2). politicalstab L(2). remittances L(2). aid aid L2.medi > a L(2). ozonglac
```

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>Number of obs = 27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>1.60643801</td>
<td>7</td>
<td>.229491144</td>
<td>F( 7, 19) = 51.49</td>
</tr>
<tr>
<td>Residual</td>
<td>.084682426</td>
<td>19</td>
<td>.00445697</td>
<td>Prob &gt; F = 0.0000</td>
</tr>
<tr>
<td>Total</td>
<td>1.69112044</td>
<td>26</td>
<td>.065043094</td>
<td>R-squared = 0.9499</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Adj R-squared = 0.9315</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Root MSE = .06676</td>
</tr>
</tbody>
</table>

| nomgdp | Coef. | Std. Err. | t | P>|t| | [95% Conf. Interval] |
|--------|-------|-----------|---|------|----------------------|
| killed |       |           |   |      |                      |
| L2.    | -2.38e-06 | 1.16e-06 | -2.06 | 0.054 | -4.80e-06 \(4.33e-08\) |
| politicalstab | |       |           |   |      |                      |
| L2.    | .0247829 | .0063941 | 3.88 | 0.001 | .0114 \(0.0381659\) |
| remittances | |       |           |   |      |                      |
| L2.    | 1.06e-10  | 2.20e-11 | 4.79 | 0.000 | 5.94e-11 \(1.52e-10\) |
| aid | |       |           |   |      |                      |
| L2.    | .5013086  | .1023864 | 4.90 | 0.000 | .2870114 \(0.7156057\) |
|    | |       |           |   |      |                      |
|    | |       |           |   |      |                      |
|    | |       |           |   |      |                      |
| media | |       |           |   |      |                      |
| L2.    | .0000183  | .0000158 | 1.16 | 0.259 | -.0000146 \(0.0000513\) |
| ozonglac | |       |           |   |      |                      |
| L2.    | -6.42e-12 | 1.10e-12 | -5.82 | 0.000 | -8.73e-12 \(-4.11e-12\) |
| _cons | 1.718952 | 1.08439 | 1.59 | 0.129 | -.5507023 \(3.988607\) |

25
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
  Ho: Constant variance
  Variables: fitted values of nomgdp

  \[
  \text{chi}^2(1) = 0.01 \\
  \text{Prob} > \text{chi}^2 = 0.9426
  \]

. estat bgodfrey, lags(2)

Breusch-Godfrey LM test for autocorrelation

<table>
<thead>
<tr>
<th>lags(p)</th>
<th>chi2</th>
<th>df</th>
<th>Prob &gt; chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.657</td>
<td>2</td>
<td>0.7201</td>
</tr>
</tbody>
</table>

H0: no serial correlation