

## Nexus of Crime Rate, Misery Index and Urbanization in Pakistan

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### ABSTRACT

The co-existence of crime rate, misery index, and urbanization has become an emerging challenge across the developing globe. The present research primarily explores the economic and demographic factors affecting the crime rate in the country and identifies the co-occurrence of the crime rate, misery index, and urbanization in Pakistan. The study is based on the annual time series data to be collected through various secondary sources from 1973 to 2020. ARDL Bound testing technique has been used to determine the short-run and long-run association among the variables. The findings of the study exhibit the long-run relationship connected with crime rate, misery index, and urbanization. The results suggest that the increasing misery index and widening urbanization largely contribute to magnifying the crimes in Pakistan. The government may take suitable measures to improve the miserable situation and demotivate the urbanization factor; therefore, the crime rate may decline in the country.

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## **1. Introduction**

Crime is an act that is contrary to the rules imposed by the government authorities and is punishable by the law of a country. Any unlawful activity declared by a government or a legislative body of a state or a country is known as a crime. It is usually thought of as an evil act that creates a lot of problems and damages society. Crime is an unlawful act that is prevalent in a variety of forms, such as murder, dacoity, and robbery, which adversely affect the welfare of society (Deadman and Pyle, 1997). The main contribution to the issue of the "Economics of Crime" is generally linked to the previous creditable study by Becker (1968) and Ehrlich (1973). Becker studied criminal behavior and presented a model of criminal choice in 1968. In this model, he emphasized that the number of individuals became criminals because of more financial support for crime compared to less than one for legal work, regardless of their evils and punishments. Auolak (1999) explained that every country specifies crimes that are prohibited and illegal and imposes a penalty on individuals who disobey them. Therefore, the State has to prevent any specific behaviors that are injurious to society and punish all those who do wrong.

The coexistence of crimes and terrorism is a common phenomenon. The presence of foreign and local terrorist activities is dangerous to Pakistan. These foreign terrorist gangs are actively engaged in various terrorist activities in the country. Terrorist actions need a great deal of financial support to operate and fulfill their intentions. This financial assistance may come from organized local or foreign terrorist groups. Criminal gangs allied with political parties have shaped much of the country's prevalent violence. Consequently, shutdowns, trade unions, and transport strikes often occur in response to violence and government policies that are not suited to the economy across the country. Unfortunately, Pakistan has been a victim of uncertainty and terrorism for the last few decades, especially after a terrorist attack on the World Trade Center. Meanwhile, more than 80,000 people have been confronted with the pain of death and thousands have been injured in the war against terrorism. Unluckily, Pakistan has lost \$70 billion in financial aid to the war on terror (Mohammad, 2016). On the other hand, religious and ethnic violence has also destroyed the economy. Sunni-Shia began targeting other places of worship during religious ceremonies that had a serious impact on both Pakistan's society and economy. These sectary attacks were mostly committed by Kurrum Agency, Para Chinar, Orakzai Agency, and Hungo (Shabir et al., 2015). Many terrorist groups carry out suicide bombings to assassinate a well-known person as well as the common public. Religious groups, security agencies, and law enforcement personnel are also victims of target killings. As a result, many people have been paralyzed, injured, and killed in various attacks in Pakistan over the last two decades. While Zahid (2018) explained that there are many obstacles to the prevention of terrorism and criminal activity in the country, such as misuse of resources, low levels of training for security agencies, and less cooperative society. However, despite all these hurdles, the Pakistani government has to some extent overpowered terrorism.

There are different types of crimes, such as kidnapping, murder, theft, robbery, etc. Crimes in the form of kidnapping, target killing, and suicide attacks have increased and

become a major challenge for Pakistan. The Kidnapping report covers crimes that have a wide range of motives, including ransom kidnapping, sexual exploitation, property disputes, elopement, and others. The available crime figures in Pakistan show that crime rates are rising rapidly over time. The reasons behind this increase in crime may be huge unemployment, rising inflation (Higher OMI), poor law and order situations, and an increase in urbanization in the country. Pakistan's crime statistics show that total crimes amounted to 73,105 in 1947 and increased to 129,679 in 1971. Similarly, total crime almost doubled to 403,078 from 152,782 between 1980 and 1990, while the total figure of crimes reached 43,804 in 2007. National Crime Data (NCD) statistics show that a total of 3,256,309 cases were recorded between 2013 and 2017. The NCD shows that Pakistan's crime has steadily increased to 683,925 in 2017 compared to 677,554 in 2016. Since its inception, the total crime record has shown that Pakistan has not performed significantly concerning crimes and violence. To identify the causes and effects of the crimes, the Government of Pakistan has conducted various surveys in different parts of the country, particularly in regions where the number of crimes was relatively high but, unfortunately, quite unsatisfactory. There are so many factors that cannot allow better implementation of government policies, such as rising poverty rates (high unemployment, rising inflation), urbanization, income inequality, urbanization, corruption, and misuse of resources.

The Misery Index is considered a key economic indicator of crime in a country. It includes both inflation and unemployment rates over a given period. The first misery index, known as the Okun Misery Index (OMI), was established in the 1970s by the great economist Arthur Okun. The Okun Misery Index provides an easy and silent picture of the health of any economy and is commonly used to address people's well-being. The Okun Misery Index also assumes that higher unemployment and rising inflation are both social and economic costs. The higher the OMI greater will be the loss for average individuals in society.

The Okun Misery Index is formulated as:

$$OMI_t = \Pi_t + \mu_t \quad (1)$$

In the preceding equation  $\Pi_t$  is the rate of inflation in time  $t$ , OMI is Okun's Misery Index,  $\mu_t$  is the rate of unemployment.

The variable that has a larger impact on crime is therefore the amount of the total population living in urban areas. Whereas the process of urbanization is based on trade in different goods and services, the expansion of knowledge, economic relations, and the pooling of labor markets. In the process of urbanization, due to the accessibility of better health, education, and infrastructure facilities, people are moving rapidly toward urban areas (GOP, 2018). Meanwhile, the basic elements of rapid urbanization are changing or transferring services from the less developed to the more urbanized and industrialized sectors of the country. It means that the more industrialization there is, the more urbanization there will be. A study entitled "Crime in Urban Areas" (Gumus, 2004), explained that 30 percent of the total world population lived in urban areas

during 1950, while this ratio gradually increased to 47 percent in 2000. The researcher further estimated that this value would reach 60 percent by 2030. There is uncertainty in the cities due to overcrowding and joblessness. Glaeser (2020) has found that cities in developing countries are becoming overcrowding more rapidly, but the downsides of the density are acute in those areas. The urban wage payments seem to have disappeared with semi-skilled labor. People are angry and protest over high prices for consumer goods.

The net results of urbanization in the economy can also be seen from economic and social perspectives. From a social point of view, urbanization drives crime and its rate is higher in the cities and industrial regions of the country than in the villages. This follows the Surplus Labor Theory developed by Lewis. In this theory, Lewis (1954) explained that surplus labor has zero marginal productivity in rural areas (agricultural sector) therefore; people will migrate from rural to the most industrialized regions of the country to earn more income. On the other hand, various other economic theories propose that urbanization is necessary for the process of industrial growth and development. Many economists also believe that the availability of labor for the industrial sector is due to more urbanization. Krivo and Peterson (1996) have explained that urbanization can also endorse crimes; consequently, crimes generally take place in large cities and the industrial areas of the country.

Like other developing nations in the world, Pakistan has also experienced dynamic trends in crime rate, misery index, and urbanization since independence. Every year cities become overcrowded which dramatically increases socio-economic problems, overcrowded population in industrialized areas, security of wealth, and additional crimes. As a result, Pakistan's crime rate is primarily determined by a variety of economic, socioeconomic, and demographic factors, such as higher misery index (rising prices, huge unemployment), poverty, income inequality, and rapid urban population growth. Various studies have described that the misery index exposes the welfare of society, e.g. the higher value of the misery index determines less prosperity and the lower value exhibits much prosperity for society (Saboor et al., 2016). While Haider and Ali (2015) pointed out that this type of rapid urbanization growth will lead to youth unemployment and shift people's minds to crimes. Nevertheless, unfortunately, urbanization is increasing at an immense level, and as a result; Pakistan's urban population will rise by 140 percent almost by 2030.

## **2. Theoretical Framework**

Crime is the result of a wide range of social, economic, cultural, and family circumstances and geographical factors that motivate crimes. It is very imperative to understand the origin, meanings, and roots of crimes to put off or stop crimes. Many researchers have worked on the crime function around the globe. However, the deep relationship between OMI, urbanization, and crimes in Pakistan needs to be well-addressed and appropriately identified. Because in Pakistan it is the higher misery and overcrowding of urban areas, that can set people's minds to become criminals. As a result, most of the issues need attention, such as, what are the major causes that increase

the rate of crime? How does urbanization motivate crimes? Such issues need a great deal of attention from governments and policymakers to solve these problems. The Government of Pakistan has therefore taken several steps to control crime and has succeeded (Chaudhry, 2015). For example, surveys were carried out to identify those parts of the country by cities or regions where the occurrence of crime was relatively high along with their main causes. As a result, various steps have also been taken in these regions /cities to control crimes, but unfortunately, the circumstances have been rather disappointing due to corruption, poor policy implementation, and rising terrorist attacks. In addition, the lack of integrity and influence on the courts has also encouraged crime in the country.

The widening of crime, urbanization, and MI statistics throughout the developing nations has given rise to a sort of issue. In the context of the high misery index (rising inflation and worsening unemployment), people are under stress, which suspends moral and ethical values in society and tend to commit crimes. At the same instance, the role of the Government has been commonly recognized. To well address the importance of the present problem, the on-hand study focuses on how to identify the crime rate and how to look at the burning issue of urbanization, and to suggest some important policy measures to help in controlling and preventing crimes in Pakistan. The present study builds the index of misery, i.e. the Okun's Misery Index (OMI) and the crime function, which are responsible for increasing crimes in the country.

### **3. Statement of the Problem**

Pakistan is devastated by numerous socio-economic problems. Pakistan's real question is how to achieve reliable growth while facing many challenges such as poverty, an increase in urban population, soaring inflation, vast unemployment, increasing crimes, and unequal distribution of income. Copious literature shows the assertion that shocking economic situations lead to the tendency of a person to take part in criminal proceedings, which is sequentially created and continued by urbanization and OMI throughout the entire population. The present research seeks to estimate the role of crimes in the presence of Okun's misery index and rapid urbanization in Pakistan with the help of the well-known ARDL Bound approach. This study also describes and analyzes economic and demographic factors along with economic factors that may increase crimes in Pakistan. The key objectives of this study are the development of the crime function to identify the responsible factors of crime and investigate the relationship between crime rate, misery index, and urbanization, as well as providing suggestions to policymakers on who can prevent future crime in Pakistan.

### **4. Literature Review**

In this chapter, the researcher discussed the previously available crime function literature and its various determinants. This section helps to make the present research work more valuable in light of the available relevant literature. The study in hand has a unique feature in defining and identifying demographic and economic factors that have a greater role to play in creating crime in society. This study calls for a fresh perspective on the knowledge of the misery index, urbanization, and crime rate, as well as the

“Economic Theory of Crime” with various academic research organizations. There are many research works with little exertion to address the issues of misery index, urbanization, and crime rate. This paper's insights will help to plug the gaps in the literature and add more to the existing knowledge. It will also be feasible for policymakers to reduce the determinants of crime.

Studying criminal behavior of the individuals Marselli and Vannini (1997) explained that each individual wants to maximize their use of the available resources. Like other individuals, they also want to maximize their utilities by adopting both legal and illegal activities. If the cost of a crime is less than its benefit, one can commit a crime. Similarly, Sah (1991) analyzed the individual actual and estimated probabilities to be punished after a crime has been committed. He also assumed that criminals are committing crimes because their estimated probabilities of punishment are less than the actual probability to be punished. While Myers, (1983) explained that punishing criminals is not an effective way to prevent crimes. It is better to create more employment opportunities than to spend a huge amount on arresting and punishing criminals. Whereas Ehrlich (1973) pointed out that increasing unemployment is a key indicator of declining income-earning opportunities in the legal sector. The author also demonstrated that the increase in the unemployment rate reduces people's participation in the legal sector and thus increases crimes in society. Freeman's (1996) study has indicated that crime rates are rising at a younger stage than children and adults. While Tillman (1987) analyzed the California crime scenario and described that at least one-third of the males were confined between the ages of 18 and 30.

Thornberry (1984) and Wong (1995) have observed that unemployed people are likely to take some other means of acquiring money. Similarly, for an unemployed individual, the cost of becoming a criminal is too low, which may push an individual to engage in criminal activity. Unemployment is therefore likely to have a positive impact on crimes. Whereas, Farrington et al. (1986) worked and preceded problems related to the finding of causality between unemployment and crime rates. They looked at the criminal records of individuals and found that unemployment increases one's chances of becoming a criminal. Their results show that, during the period of unemployment, the crime rate was somewhat three times higher than during the period of employment. Similarly, Tang (2009) studied the association between the rate of unemployment, inflation rate, and crimes in the Malaysian economy. The researcher has identified a strong positive impact of rising inflation and a high unemployment rate (OMI) on crimes over the long term, while short-term differences may arise. Likewise, some other studies have shown a positive association between the index of misery and the rate of crime (Cantor and Land, 1985) and (Tang and Lean, 2009). Tang and Lean (2007) also looked at the correlation between the crime rate, unemployment, and inflation in the United States. The study results indicated that both the rate of unemployment and rising inflation have had a positive impact on crime rates. Their findings also suggested that the rate of inflation and the rate of unemployment Granger-caused crimes in the United States during the study period. Furthermore, the commitment to illegal activities imposed heavy costs on society, which further discouraged the country's international

reputation at the world level. In the United States, for example, crimes are possible to cost the public less than \$300 billion and more than \$1 trillion every year.

Ajide (2019) examined the effect of the institutional quality & Misery Index on crimes in Nigeria. The researcher analyzed annual time series data for the period 1986 to 2016 by using the well-known ARDL approach to co-integration techniques. The study explained that there is a strong positive long-run connection between the variables. In addition, it has shown that institutional quality has much reduced the rate of crime during the short-term period, while economic misery has increased the crimes in the country. In the same way, Raja and Ullah (2013) investigated the association between criminal activity and economic status between 1990 and 2011 in Pakistan. They used Johanson's co-integration technique to analyze the long-run relationship between inflation rate, inequality, and increase in female employment. The results brought to the conclusion that the increase in inequality, female employment, and the rate of inflation had a momentous and positive impact on crimes. The higher the index of misery, the lower the consumer demand, which gradually lowers the country's growth rate, is also being tested. Thus, the rising misery index has a negative effect on economic growth that may become exasperated.

Dadgar and Nazari (2018) studied the effect of economic growth and good governance on the misery index in the Iranian economy by using time series data for the period 1974 to 2011. The study employed government effectiveness as a proxy variable for good governance and applied Vector Auto-Regressive (VAR) Model for analysis purposes. The Dickey-Fuller test is employed for testing the stability of the study variables. The finding of the study explored the negative relationship between economic growth and the misery index. Similarly, Lovell and Tien (2000) and Yang & Lester (1992) concluded that the index of misery is inversely linked to the opinion of individuals who are positively associated with the rate of suicide. While Teles (2004) explored the consequences of macro-economic policies on crimes and concluded that macro-economic policies could have an impact on crime. In the same way, Coomer (2003) examined the control of macroeconomic factors over crimes and found a positive significant connection between rising unemployment, high inflation, poverty, and crimes. Munley et al. (2011) also explained that rising inflation and high unemployment in Pakistan have more adverse effects on individuals than declining incomes and rising interest rates.

While exploring the crime-urbanization scenario there is a common dilemma around the world that, as urban populations increase, more crimes take place. Thus, the misery index is a key factor that has increased the rate of crime in Pakistan. However, the index of misery does not fully capture the rate of crime. There must be other factors, such as inequality, illiteracy and police efforts, and urbanization, which may lead to an increase in crimes in Pakistan. Gillani et al. (2009) and Omotor (2009) also explained that inflation had a positive impact on crime rates. In light of the crime-urbanization relationship, Iqbal and Jalil (2010) studied annual time series data on crime rate and urbanization in Pakistan for the period 1964 to 2008. The results of the study showed a positive relationship between urbanization and the crime rate in Pakistan. Galvin,

(2002) also argued that urbanization has increased crime in a country. Whereas, Haider and Haider (2006) explained that the problem of urbanization in Pakistan is becoming more complex and more serious. If the government does not play an active role, it will rise by almost 140 percent in 2030. As a result, more urbanization is likely to boost crime, as crimes generally take place in more urbanized and larger cities (Kriwo and Peterson, 1996). Similarly, Gumus (2004) empirically explored the determinants of crime in more urbanized areas of the United States (U.S.) using the Ordinary Least Square (OLS) regression method. The researcher concluded that income inequality, low per capita income, the existence of a black population, the unemployment rate, and police department expenditure play a greater role in the determination of crime rates. There is less crime in rural areas due to a lower population density, and little chance of hiding their crimes because of greater recognition among rural people. Conversely, there is a greater chance of hiding crimes from criminals due to less recognition of people in urban areas. Consequently, the main reality of crime in urban areas is the lower chance of apprehension and recognition (Glaeser and Priest, 1996). As a result, the increase in urbanization has paved the way for more crimes (Gaviria, 2002).

The economic position of society has an impact on both types and numbers of violent crimes. Dadgar et al. (2020) looked at the effect of the misery index and the employment rate of women on violent crime in Iran between 1981 and 2017. The study results showed a strong positive relationship between the index of misery and violent crimes in Iran, both in the short run and long run. The researchers further explained that decreasing the index of misery and increasing economic growth has significantly decreased violent crimes in Iran. Similarly, Inbaraj (2010), Nunley et al. (2011), and Pirae and Barzegar (2011) also found a long-run relationship between crime rate, misery index, and urbanization. Saboor et al. (2016) looked at the problem of crime, urbanization, misery index, and quasi-democracy between 1975 and 2015. They used ARDL techniques to examine the relationship between crime rates and the urbanization & misery index for Pakistan's economy. The study examined the long-run relationship between the crime rate and the country's misery index. They also explained that high misery index causes more crimes and suggested keeping an eye on the key socio-economic factors to decrease the exposure of crimes in the country.

Although the work of various researchers was incredibly inadequate, unfortunately, the factor of OMI and urbanization has not been well addressed in Pakistan, which calls for answers to a variety of questions; what are the main factors of increasing criminal activity in the country? Does urbanization lead Pakistan's population to criminal behavior? Do rising inflation and unemployment (OMI) promote crimes in society? Likewise, different questions call for the attention of researchers and policymakers to be answered. This study is therefore intended to describe and analyze the economic and socioeconomic factors that increase crime in Pakistan. The main objective of the study is to investigate the relationship between crime rate, OMI, and urbanization and to suggest policies that can prevent crimes in Pakistan. The study in hand builds the index of misery and the function of crime to determine the responsible factors. The key objectives of the research are to estimate the role of crime in the presence of the misery



index in Pakistan with the help of the ARDL approach. Linking the study in hand to the economic theory of crime the researchers took help from various crime theories like Criminal Behavior Theory, Routine Activity Theory, and Crime Pattern Theory. Researchers in different disciplines have shown that there are interconnected elements that increase an individual's ability to develop non-standard and criminal behavior (Merton, 1968). For example, the Routine Activity Theory (Cohen and Felson, 1979) and the Crime Pattern Theory (Brantingham and Brantingham, 1993) propose that the incidence of a crime involves the intersection of three factors in time and space: the offending criminal, the appropriate target and the lack of a capable custodian. This study follows the economic theory of criminal behavior that is applied to the neoclassical theory of demand. The theory is legitimized by Nobel laureate Gary Becker in 1968, who argues that likely criminals are economically rational and have a significant role to play in responding to the discouraging incentives of the criminal justice system. Becker compares the gain from committing a crime with the expected cost (risk of punishment, prospect of social disgrace). In the current study, the researchers have tried to test the hypothesis to be examined and linked to the objectives of the study. Accordingly, the present study focused on the following set of assumptions from the existing work:

H<sub>2a</sub>: OMI has a significant and positive impact on the rate of crimes.

H<sub>2b</sub>: Urbanization has a positive and considerable impact on the rate of crime.

## 5. Research Methodology

This chapter comprises three sections, the first section of which contains a problem related to variable measurement. The second section begins with the application of the methodology, i.e. finding the problem of unit root and co-integration through the ARDL model, which can provide long-term and short-term relationships between variables. Third and last section deals with econometric problems such as causality, serial correlation, heteroskedasticity, and testing whether or not the series is normally distributed. To address the relationship between the explanatory variables and the explained variables well, it is very important to select the appropriate model. Based on the available literature, and taking into account Coomer (2003), Gumus (2004), Saboor et al. (2016), and Gillani et al. (2009), we have chosen a Crime Model in which the following economic and demographic determinants of crime are persuaded.

Crime = f (Misery Index, Urbanization)

## 6. Study Area and Collection of Data

The study is based on annual time series secondary data on the misery index, urbanization, and crime rate for Pakistan's economy for the period 1973 to 2020. The study in hand is based on Pakistan's national economic statistics. The misery index and urbanization data set are collected from different sources, such as International Financial Statistics, and different issues of the Pakistan Economic Survey. However, data on crime rate have been obtained from the Pakistan Bureau of Police Research and Development, Ministry of the Interior, Islamabad for research purposes.

## 7. Variables of the Study

### 7.1 Misery index

Misery Index (MI) is an economic indicator that assumes that higher unemployment and rising inflation have both social and economic costs for a country. Misery Index is equal to the addition of the rate of inflation and the rate of unemployment for a particular period. The first known misery index Okun Misery Index (OMI) was established in the 1970s by the great economist Arthur Okun. He wanted to illustrate the joint effect of the rising unemployment rate and inflation rate at that time. OMI gives an easy and silent picture of the economic performance of a country. Misery Index adopts the well-known Okun's Law, which shows that a percentage fall in the unemployment rate causes real GNP to rise by 3%.

The Okun Misery Index (Okun, 1970) is commonly used to address people's welfare levels. The Okun Misery Index is expressed as:

$$OMI_t = \Theta_t + u_t \quad (2)$$

where OMI is the well-known Okun's Misery Index,  $\mu$  is the rate of unemployment, and  $\Theta$  is the rate of inflation.

### 7.2 Urbanization

Urbanization is a situation in which people migrate from rural areas to the more urbanized and industrialized areas of the country and a key demographic variable that has a greater impact on the country's economic conditions. It has both positive and negative consequences, depending on the nature of the urbanization. Finding the right jobs and better livelihoods is not bad enough to move towards urbanized and industrial sectors. In this study, urban population growth is considered to be urbanization for analysis purposes.

### 7.3 Crime Rate

Any wrongdoing, which is classified by the law, government, or legislative body of the country, is known as a crime. Where, the crime rate is equal to all reported crimes, divided by a total population of ten thousand in a year. It varies from nation to nation and from time to time. Auolak (1999) stated that every government is responsible for taking action against crimes and for preventing those activities that are harmful to society as well as for punishing all those who do wrong. Like other nations, Pakistan also specifies the chain of crimes (prohibited and unlawful) and imposes a penalty on all those who go against them.

### 7.4 Crime Function

Crime function is the proportion of all crimes reported to the total population per ten thousand per year. It is generally calculated as follows:

$$CR_t = \frac{\text{All Reported Crimes}_t}{(\text{Population}_t / 10,000)} \quad (3)$$

In this function,  $CR_t$ , is the crime rate in time  $t$ , and is the fraction of the entire described crimes per 10,000 population.

The general crime function used to investigate the link between the index of misery, urbanization, and the crime rate is illustrated as follows:

$$Cr_t = \beta_0 + \sum_{i=1}^p \beta_i X_{it} + \mu_t \quad (4)$$

where  $Cr_t$  is the total number of Crimes per 10,000 people,  $X_i$  is the vector of independent variables in the crime function,  $\mu$  is the error term,  $t$  is subscript for the given time series,  $\beta_0$  is the constant/intercept term while  $\beta_i$  denotes a vector of the partial slope coefficients.

## 8. Model Selection

To investigate the short-run and long-run relationship between variables, the researchers used the ARDL model proposed by the great researchers Pesaran et al. (2001). After testing the selection criteria of the model, the result suggests using the ARDL Bond test that is appropriate for testing such a relationship. Whereas, Narayan & Smyth, (2006) also pointed out that the Bound test approach is better for small samples. Similarly, Tang and Nair (2002) and Mah (2000) documented that by using the Bound techniques one does not require any pre-testing problems for stationary. The advantage of using ARDL is that it does not take into account the problems originating from the dissimilar orders of integration of the study variables. That is why, that the present research work has used the method of Auto Regressive Distributive Lag (ARDL) technique, which best explains the impact of the urbanization and misery index on the crime rate. Because of the merits of the proposed methodology, Saboor et al. (2016) have also used a similar technique in an earlier study.

Therefore, the following equation is modeled to expose the co-integration between OMI, urbanization, and crime rate.

$$CR = \beta_0 + \gamma_1 OMI + \gamma_2 URBN + v_i \quad (5)$$

CR= total number of crimes per 10,000 people

OMI= Okun's Misery Index

URBN= the growth rate of urban population (Urbanization)

$v_i$  = error term

## 9. Method of Analysis

### 9.1 Unit-root procedure

In the co-integration analysis, most time series data have a variety of econometric problems, such as unit root, serial correlation, and hetroskedasticity. Data with a unit root problem have a spurious result that does not provide accurate information on the problem (Harris and Sollis, 2003). Unit-root data often leads to high  $R^2$  values and significant t-ratios, although there is no meaningful full relationship between the variables. That is why that most time series suffer from unit root problems (Nelson and Plosser, 1982) and the presence of non-stationary data contribute to false and missing results. For this reason, to process the time series, it is necessary to check and identify the unit-root problem in any time series data (Gujarati, 2003).

$$\Delta Y_t = \beta_1 + \beta_2 t + \alpha Y_t - 1 + \lambda_i \sum \Delta Y_t - i + v_t \quad (6)$$

### 9.2 Method following Estimation of the Crime Model

The property of time series is imperative for all time series regression studies. In order, to accomplish the core objectives of the present research, the study seeks to use the ARDL bound test approach. A similar methodology has already been used by different authors (Saboor et al., 2016; Nelson and Plosser, 1982; Pasaran et al., 2001). Thus, the ARDL Bound test is best to analyze the presence of a particular long-term association between the rate of crime, OMI, and urbanization. The crime model is as follows:

$$dCR_t = \beta_0 + v_1 CR_{t-1} + v_2 OMI_{t-1} + v_3 URBN_{t-1} + \sum_{i=1}^p \gamma_{1i} dCR_{t-i} + \sum_{i=0}^p \gamma_{2i} dOMI_{t-i} + \sum_{i=0}^p \gamma_{3i} dURBN_{t-i} + \varepsilon_t \quad (7)$$

where,  $\beta_0 = \text{constant}$ ,

CR= is the rate of crime per 10,000 people,

OMI = Okun's misery index,

URBN = Growth rate of the urban population,

p = optimum lag length

$v_i, \gamma_i = \text{parameters}$

## 10. Results and Discussion

As mentioned earlier, the presence of a unit root is very important for any time series analysis. There are many statistical tools and methods like, graphical presentation, Ljung Box (LB), correlogram techniques, Dickey-Fuller (DF) test, Augmented Dickey-Fuller (ADF) test, and Philips Perron unit root test, which identify the existence of stationary in any time series. In this study, the researcher has used the ADF unit-root test statistics technique to test the stationary problem in the present time series separately for each variable included in the study. For the crime model, the results of the ADF test are shown in Table 1. While the main results of the analysis are exposed in Table 2, which explains the association between crime rate, OMI, and urbanization in Pakistan for the period 1973 to 2020.

Table 1 of the ADF test results shows that crime rate and urbanization are integrated at I(1) while OMI is integrated at zero I(0) at 5%. It was found that no variable was integrated into I(2). The best way to explore the relationship between these variables is to test ARDL (Greenberg, 2001). In this study, the ARDL test is used in Eviews 9 to investigate the relationship between crime rate, OMI, and urbanization. This model is specified as the SBC ARDL Crime Model (1, 1, 1). The relationship between OMI, urbanization, and crime rates for the period 1973 to 2020 is shown in Table 1. The data shows that there is a positive and upward trend among OMI, urbanization, and crime rates in Pakistan. While the rising trend in crime is not entirely captured by the OMI. Other factors such as illiteracy, lack of effort by the police department (Halim, 2006), and an increase in urbanization (Khan et al., 2015) may be the source of rising crime in Pakistan.

Table 1. ADF Statistics

Variables	Order of integration at Level		Order of integration at 1st difference		Decision at 5% significance level
	Intercept	Trend and Intercept	Intercept	Trend and Intercept	
Crime Rate	-1.0703 (0.7196)	-2.742 (0.2102)	-7.2374 (0.0000)	-7.1439 (0.0000)	I(1)
OMI	-4.5374 (0.0006)	-4.3757 (0.0058)	----	----	I(0)
Urbanization	1.9665 (0.9998)	-2.0401 (0.4569)	-2.7179 (0.0787)	-3.5589 (0.0448)	I(1)

Source: Research findings.

Figures in parentheses are the probabilities of each variable.

### 10.1 ARDL Test for Crime Model

The estimated short-run and long-run outcomes of the ARDL crime model are shown in Table 2. The result is that OMI is statistically significant with a positive sign. This identifies the long-run relationship between OMI and the rate of crime in Pakistan during the study period. The increase in OMI exhibits economic uncertainty and thus affects the individual behavior that drives them to become criminals. This also indicates that, as the OMI increases, the crime rate will also increase. The results in hand are consistent with (Saboor et al., 2016; Yang and Lester, 1992) which found a similar positive association between the OMI and the crime rate. The second variable urbanization is also positively significant. This also means that there is a co-integration between crime rate and urbanization. In the meantime, it informs that, as people settle in the more expensive (urban) areas, their expenditure on consumption will increase, and, to overcome high expenditure, most of them will become criminals. As a result, urbanization is becoming a source of crime in urbanized and industrial areas of the country. The findings are consistent with those (Glaeser and Sacerdote, 1996; Galvin, 2002; Gumus, 2004) which found similar and positive links between the increase in urban population and crimes.

The result of the ARDL Bound test calculated for the crime model is correspondence in form or appearance to the actual Pakistanian circumstances. The result in hand (see Table 2) explains that the F, statistical value for the bond test is 11.0390, which is greater than the upper critical bond of 3.83. We, therefore, reject the null Hypothesis of No co-integration at a 5% level of significance. This intends that there is a long-run relationship between the crime rate and the OMI in Pakistan during the study period. The long-run result indicates that, as the OMI increases by 1%, the crimes possibly will rise by 0.7 per 10,000 people. Similar positive outcomes between the OMI and the crime rate have been addressed (Inbaraj, 2010; Saboor et al., 2016; Pirae and Barzegar, 2011). Strong and consistent economic policies are needed for a better solution so that unemployment and inflation can be maintained at a desirable level that decreases OMI in the country. In the meantime, to decrease crimes, the government of Pakistan should uphold better law and order and implement strict policies so that crimes can be controlled in the country.

Table 2. The Estimation from the Selected ARDL Model

Dependent Variable: Crime Rate				
Critical bounds (F test)	Significance level			
	1%	2.5%	5%	10%
Lower bound	3.88	3.22	2.72	2.17
Upper bound	5.3	4.5	3.83	3.19
<b>Crime Model</b>				
ARDL measurements			1,1,1	
F- statistics			11.0390	
Significance Level: (5%)			Decision	
Test of ARDL specification significance				
Coefficients of long-run estimate				
OMI	0.6742 (3.7922)			
Urbanization	0.16512 (2.2735)			
Short-run ECM estimates:				
OMI	0.1603 (2.1836)			
Urbanization	7.2624 (3.4844)			
CointEg(-1)	-0.5084 (-4.7650)			
Tests of diagnostic checking				
Ramsey, s Reset for Equation Specification			0.7798 (0.3836)	
ARCH test for Heteroskedasticity			0.1059 (0.7465)	
LM Test for Serial Correlation			0.1790 (0.8368)	

Source: Research findings.

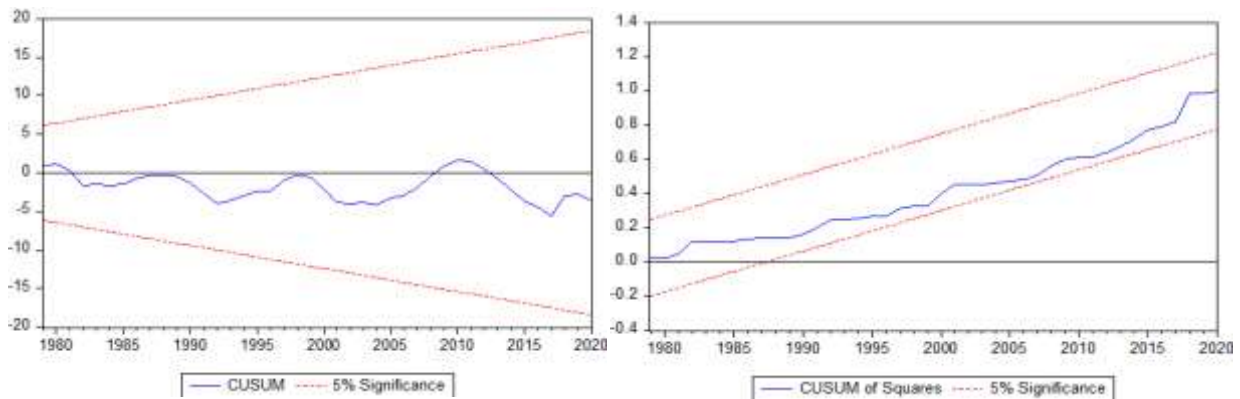
Notes: Numbers in parenthesis are the t- statistics values.

The result presented in Table 2 also shows that urbanization is positively related during the study period and has a substantial impact on the rate of crime in Pakistan. The result of the study shows that a 1 percent increase in urbanization can increase 0.2 criminals out of 10,000 people. Due to the scarcity of resources and lack of planning in urban areas, people move to more urban areas in search of higher earnings jobs and better economic facilities. This positive outcome between urbanization and crime is consistent with the findings (Krivo and Peterson, 1996; Gaviria, 2002; Galvin, 2002; Buonanno and Montolio, 2008; Iqbal and Jalil, 2010).

It is, therefore, necessary to make available to the rural regions with incentives, such as unemployment allowances, the best health facilities, a better communication system, etc., to discourage urbanization. On the other hand, the government should establish new districts that can easily absorb population density. The results further show that the Co-Integrating Equation, i.e. CoinEq (-1) has a negative, correct sign. The t-value (-4.77) shows that a short-term imbalance exists between these variables during the study period.

### 10.2 Diagnostic Test for Crime Model

The study results also explain that the relationship between OMI, urbanization, and crimes is not spurious. In the meantime, all the diagnostic tests like the Breusch Goldfrey serial correlation (LM) test, the Ramsey reset test, and the Heteroskedasticity test have been performed. The attractive useful result shows that the calculated coefficients for all variables are stable over the study period. In the Ramsey RESET test, the calculated p-value (0.78) is greater than (0.05) which indicates that the given model has the correct functional form and is best suited to finding the relationship between the rate of crime and all explanatory variables.



**Figure 2.** Parameters Stability Test (CUSUM and CUSUM of Squares)

**Source:** Research findings.

On the other hand, Figure 2 also shows the validity of the crime model because; CUSUM and CUSUM of the squares are within a 5% significance level that confirms the stability of the parameters during the analysis period. In the meantime, in the Lagrange-Multiplier (LM) test for residual serial correlation, the p-value (0.18) is greater than (0.05) and therefore there is no serial correlation between the variables. Similarly, the p-value (0.11) in the ARCH test is also larger than (0.05), which indicates that the residuals of the crime model are not heteroskedastic.

## 11. Conclusion

The study aimed to pursue and investigate the relationship between the crime rate, misery index, and urbanization in Pakistan. In the present study, the researcher used the ARDL Bound technique to examine the impact of OMI and urbanization on the crime rate from 1973 to 2020 in Pakistan. The study emphasized the impact of the explanatory variables on the crime rate in the short run and long run in the country. The cause and effect among the variables were checked by analyzing the data using Granger Causality Test. First, the stationarity was checked by the ADF test, and crime rate and urbanization were found stationary at first difference while OMI was integrated at level *e.i.*  $I(0)$ . The results obtained through the ARDL test are positive and significant, which explains that long-run and short-run relationships exist between crime rate, OMI, and urbanization. This research work also indicated a significant positive impact of OMI and urbanization on the crime rate during the study period. The result in hand has shown that these factors have strong helpful links to crimes. The results of the study also explored the fact that OMI is responsible for crimes in Pakistan. It is because the increase in the unemployment rate reduces the income earnings opportunities that motivate individuals to commit crimes. The positive association between crime rate and urbanization reflects that urbanization reduces employment opportunities in urban areas that can inspire individuals to commit crimes.

Thus, from the above discussion, we conclude that the rate of crime is strongly influenced by OMI and urbanization in Pakistan. The reason is that, when the rate of unemployment heightens, the income-earning possibility decrease, which leads individuals to become criminals. Similarly, the cost of committing crime falls on unemployed workers and thus they engage in criminal activities. The increase in the

general price level (inflation) has also a criminal effect on low-income holders by reducing their moral threshold. It can therefore be reasoned that the rich-poor gap generated by high inflation induces individuals to commit crimes. Hence, we resolve that the rate of crime is strongly influenced by OMI and urbanization in Pakistan.

Since this study is proposed to prevent criminal activity in Pakistan, all of these can help both policymakers and the government to bring about long-term economic growth and strong economic policies in Pakistan. In light of the results of this study, the following recommendations are proposed to prevent or reduce the rate of crime in Pakistan. These recommendations may help the government, as well as policymakers, to reduce the rate of crime in Pakistan.

- First, to test the crime scenario, major economic and demographic elements of crime such as OMI and urbanization need to be effectively addressed by the relevant departments and policymakers. To reduce the crime rate, governments should pursue policies that boost economic growth along with tolerable inflation rates and unemployment.
- Second, to reduce the rate of crime, managing urbanization is also essential. Moreover, to control the migration of the gigantic population, incentives should be given to the rural people such as better health and education facilities, a good communication system, better infrastructure facilities, and more employment opportunities. All of this will prevent massive migration to more urbanized areas and thus save the country from a massive loss of life and property at the hands of criminals.
- Third, security agencies should strictly keep an eye on criminals and their patrons. The judiciary should punish them in good time to control crimes in the country.

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