

## Analysing Crimes And Economic Misery In Pakistan: Ardl Bound Testing Approach

**Shalil Zaman** (Corresponding Author)

PhD Scholar Department of Economics, Preston University Kohat, Islamabad Campus,  
Sector H-8/1 Islamabad, Pakistan.

shalilzaman@gmail.com

&

**Atta Ullah Khan**

Assistant Professor Department of Economics, Allama Iqbal Open University, Islamabad Pakistan.

attaullah982@yahoo.com

### **Abstract**

*The present study explains economic discomfort, financial shocks, and rapid urbanization increase crime in a country. Furthermore, this research work highlights the extent to which economic misery and an increase in urbanization create countless socioeconomic problems in society. The study used annual time series secondary data for the period 1990 to 2021 collected from different sources. Researchers have found very limited evidence of economic misery and crime in the existing literature on Pakistan. Thus, carrying out research work on the subject was the need of the day. The foremost objective of the research work was to examine crime rates in the presence of economic misery, as denoted by Hanke's Annual Misery Index (HAMI) and urbanization in Pakistan. The stationarity of the data has been checked by correlogram and Ljung-Box (LB) statistics. The study used an Autoregressive Distributed Lags approach to investigate how economic misery and urbanization affect criminal activity in Pakistan. The crime model produced substantial results, and the outcomes are consistent with the expectations. The findings revealed that the HAMI and urbanization coefficients are significant with a positive sign, implying that economic hardship and an increase in urban population have exacerbated Pakistan's crime rate. To control crimes, the government might have to adopt new strategies that may decrease economic misery, i.e., keep inflation at a desirable level, reduce unemployment, improve economic growth, and discourage urbanization.*

**Keywords:** crimes, economic misery, urbanization, ARDL, Pakistan.

### **Introduction**

"Crime" is defined as "an offence against a person or state that is subject to legal sanctions." The problem of crime is a well-known universal phenomenon. Crime is a global problem, but mindsets toward it, criminal activities, and how to cope with them are not. Every society in the world strongly opposes it as a public wrong-doing. Crime includes murder, attempt to murder, kidnapping, robbery, burglary, cattle theft, and other heinous acts. Every country defines crime according to its own unique standards. Nobody is a criminal by birth. A person's criminal intent and behaviour are the result of a variety of social, economic, biological, and psychological factors that contribute to crime (IWD, 2003). Through the economic structure, crimes either directly or indirectly affect the economic and socioeconomic factors of a nation. It adversely affects the function and effectiveness of public servants, distorts public policies, and consequently results in ineffective resource allocation. Through disrupting the implementation of better law and order, it has negatively impacted the provision of justice in many countries and has had a significant negative impact on the world's rapid development process. Along with slowing down the working capacities of society, it has also slowed down the pace of global economic growth. Consequently, it is the greatest impediment to socioeconomic development and has given priority to crime control initiatives in its strategies for improving the quality of governance to reduce stress crimes (World Bank, 1997). Crime remains a big problem throughout the world. The economy of Pakistan has faced similar incidents since its first day. There are undoubtedly many criminal activities that range in type and severity from society to society, but their existence cannot be ignored. For example, criminals and terrorists frequently mark local businessmen and high-flying classes to take out

ransoms for earnings or to manage their activities. People serving in various government organizations and foreign employees of different non-government organizations (NGOs) have been targeted for kidnapping and ransom purposes. Affected families often negotiate and give ransoms without police notice or attachment. Thus, criminals that are involved in kidnappings are not commonly caught or not treated with justice (Grossman & Helpman, 2002). The economic disparity can also lead to a soaring degree of frustration, stress, and mental anguish, which consequently encourages people to participate in illegal activities. People's increasing criminal activities have become a major impediment to economic growth. Criminal habits primarily kill off social events and spread fear, which further creates and perpetuates social anxiety in society. Undoubtedly, the crime rate has been increasing in almost every country in the world. However, in Pakistan, the available crime statistics depict an alarming rate of increase eventually. The considerable boost in the rate of crime may be due to high unemployment, rising inflation, or an increase in the urban population (Gillani et al., 2009). On the other hand, cities have witnessed considerable unrest in recent years. Protests erupted in response to high housing prices and gentrification, while the urban wage premium appears to have vanished with less skilled labor. Cities in the developing world are growing more rapidly, but the downsides of density are acute in those places (Glaeser, 2020). Pakistan is a labor-abundant nation. There is talent in the country, but unfortunately, it is passing through a crucial economic situation. A huge number of the labour force is engaged in project-based jobs where they obtain lower salaries and are deprived of all basic human rights. Workers are losing their jobs as their tenure comes to an end. The administration is not in a position to defend their rights. In Pakistan, there are two main sectors where labour engages themselves: one is the formal sector, and the other is the informal sector. Labour laws do not protect them, especially the working force of the informal sector. The lack of opportunities, the unjust division of resources amongst people, and the lack of learning and training in the informal sector have decreased employment opportunities in Pakistan (Chaudhary, 2003). Economy of Pakistan experiencing economic miseries like high unemployment, rising inflation, rapid population growth, rising poverty, income-inequality and rapid increase in urbanization. In Pakistan, one fourth of the total population lives in extreme poverty, i.e., less than one dollar per day. This means that a large part of the public does not have adequate basic needs and opportunities. Therefore, it mostly causes huge economic deprivation and large environmental and political shocks in the country. Therefore, due to the meager availability of better socio-economic facilities, urbanization continuously increased every year. People are rapidly moving towards urban areas to avail themselves of improved socio-economic services (GOP, 2019). Unfortunately, due to high poverty, increased debt servicing, high unemployment, rising inflation, increase in aggregate demand, and unsustainable GDP growth, the economy of Pakistan does not grow to the desirable level (Ali & Rehman, 2015). In Pakistan, a devastating trend in urbanization has become a serious issue, and thus, every year cities are becoming overcrowded, drastically increasing socio-economic problems. Some recent studies have explained that increased urbanization is not inherently bad because society has the right to raise living standards and look for suitable employment opportunities, which are more prevalent in urban areas. Therefore, many economists recommend that urbanization is beneficial and encourages economic growth in the economy. Many other studies explain that urbanization is not good for the health of the economy because crimes easily happen in big cities and in more urbanized regions, and thus it encourages crimes (Krivo & Peterson, 1996). This study at hand attempted to identify and probe the demographic and socioeconomic factors accountable for encouraging crimes in Pakistan. The researchers have constructed the Hanke's Annual Misery Index to empirically investigate the association between crime rate, economic misery, and urbanization and to suggest policy procedures to help in checking and preventing crime rate in Pakistan. Besides these attributes, there are so many other aspects that may affect crimes, but due to time constraints, such variables are not incorporated in the current study.

### **Objectives of Study**

The present research aims to review crimes, particularly with reference to the miserable conditions and more urbanization in Pakistan. In light of the present study, objectives are set as:

1. To analyze the impact of miserable economic conditions and increasing urbanization on crimes in Pakistan.
2. To devise an appropriate policy implications in the light of empirical results.

## Review of Literature

Pakistan has experienced tough economic circumstances since its independence. This vulnerability to harsh economic circumstances binds criminal networks to launder their illicit proceeds. These root causes have been seen through the prism of theories presented by various economists and criminologists. The researchers tried to analyze the criminological spread of crimes, particularly with reference to economic misery and the rapid increase in urban populations in Pakistan. By reviewing the existing literature, it has been found that very limited and specific miserable activities have been addressed on the basis of criminological aspects. Thus, research work on the subject is needed at the present time in the country. Becker (1968) studied that in economic models of criminal activities, the decisions of criminal individuals are examined in a fractional and unstable equilibrium perception. These models have not documented that the opportunity for punishment is absolutely dependent on the total number of crimes that are encountered. According to Ehrlich (1974), as crime rates rise, the police must work harder to keep them under control, and prisons may become overcrowded. As a result, fewer criminals are apprehended and found guilty. Additionally, when prisons become overcrowded, the prison administration has no choice but to release criminals as quickly as possible. Thus, the likelihood that other criminals will be apprehended, imprisoned, and punished decreases as a person commits more crimes. Likewise Sah (1991) investigated the dynamics of actual and expected probabilities, as well as their implications for crime rates. The researcher assumed that agents are not conscious of the correct possibility of punishment and are not capable of locating the probability from identified available information. The author suggests that if an individual commits a crime, then he/she is expected to presume that the possibility of being penalized is lower than his/her earlier estimation, thus to some extent affecting the decline in crime rates. Teles (2004), explored the sound effects of monetary and fiscal policies on crime rate determination. The study investigated the impact of macroeconomic policies on crime and concluded that fiscal policy has the most impact on crime from start to finish. Government spending and monetary policy influence crime in the course of rising inflation. The impact of the institutional-quality and misery indexes on Nigeria's crime rate was examined by Ajide in 2019. Time series secondary data from 1986 to 2016 was used in the study. Using ARDL co-integration techniques, the researcher discovered a long-term, strong positive relationship between the variables. The study went on to say that while the country's crime rate has increased due to economic hardship, it has decreased significantly in the short term due to high institutional quality. Dadgar, et al., (2020) investigated the relationship between the employment rate of women, the violent crime and the misery index in Iran between 1981 and 2017. According to the study's findings, there is a significant correlation between Iran's violent crime rate and its index of misery over both the short and long-term. The researchers went on to say that lowering the index of misery, boosting economic growth, and raising the cost of committing a crime can all significantly reduce violent crimes in Iran. Khan et al., (2015) analyzed the impact of unemployment rate, literacy rate, poverty, and per capita income on the crime rate in Pakistan. The researchers have originated a positive correlation between unemployment and crime and a negative association between education level and crime. Whereas, Umair, (2019) studied the socio-economic determinants of crime in Pakistan for the years of 2006 to 2016. In this analysis, the researcher has used crime-dependent variables and population growth, inflation, national income, and economic growth as independent variables. The study used correlation and regression approaches to evaluate the socio-economic impact on crimes during the study period. As a result, population and economic growth have a clear positive relationship with crime, while inflation and wages have a negative relationship with crime in the short term. The results further explained that there is no long-run relationship among inflation, national income and population, with the exception of economic growth and crime. Wang et al., (2019) empirically analyzed the impact of the financial system and the misery index on Pakistan's economic growth from 1989 to 2017. The co-integration of data processing in the study used the Autoregressive-Distributed Lag (ARDL) methodology. The results of the analysis point to a long-term relationship between the study's variables. The outcome also explains that while the poverty index has a detrimental impact on economic advancement, the FD index, misery index, interest rate, trade openness, and remittances all have long-term effects on the GDP of the nation. According to the study, the government should create efficient policies to reduce unemployment and inflation. Shah et al., (2022) studied the

relationship among crime rate, misery indices, and poverty in Pakistan. The study used time series data for the period 1965-2018. Granger causality and ARDL were utilized in the study to analyze the long-run and short-run correlations among the variables. The study's result predicts that the misery index, poverty, and crime rate are cointegrated. Furthermore, it is clear from the study's findings that democratic governments have been less successful than dictatorships in addressing the socio-economic perspectives of human life. Gumus (2004) used the well-known regression technique of OLS in urban areas of the United States to empirically examine the socioeconomic determinants of crime. The researcher explained that 30% of the population throughout the world was living in urban areas in 1950, whereas this value reached 47% in 2000. It is expected that urbanization will reach 60% of the total population in 2030. The author further explained that such a majestic increase in urbanization will generate youth unemployment that can further push the unemployed force towards crime. Consequently, urbanization, income inequality, and many other economic and socio-economic factors increase the crime rate. Glaeser and Sacerdote, (1999) examined the relationship between crimes in rural and urban regions. The researchers explained that in rural regions, crimes are less because of lower population density and people also know each other. Therefore, criminals have fewer opportunities to take part in criminal activities and to hide themselves. In fact, the criminal activities in urban spheres are due to the high chance of detention, fewer intact families and less recognition of each other. Haider and Ali (2015); Haider and Haider (2006); and Galvin (2002) discovered similar positive relationships between increases in urban populations and crime. Iqbal and Jalil (2010) looked at Pakistan's urbanization and crime rates. The study used annual time series data from 1964 to 2008. The study found a strong positive correlation between Pakistan's urbanization and crime rate.

## Methodology

### Data and Variables

During the 1990s and onwards, the economy of Pakistan has faced a lot of economic problems. In the study, the crime rate has increased drastically due to many socioeconomic, demographic, and political factors. Hence, the present study has used annual time series secondary data that covers the period from 1990 to 2021. The data concerning urbanization is collected from the Federal Bureau of Statistics, Islamabad. The data for the crime rate is collected from Bureau of Police Research and Development, Ministry of Interior, Islamabad. In contrast, data for socioeconomic variables used to calculate Hanke's' annual misery index were extracted for analysis purposes from the International Financial Statistics (IFS) and World Development Indicators (WDI). The crime rate has been taken as the total number of crimes per 10,000 people, and urbanization is taken as the increase in urban populations every year. The GDP growth rate is taken as a percentage change in real GDP per capita annually; unemployment, inflation, and interest rates are in percentage form during a year.

### Measurement of the Variables

In the field of socio-economic research, the measurement of variables is considered an essential element for the purpose of analysis and finding results. In the time series study, the set of dependent and independent variables is tested to acquire accurate consequences. This research work has also followed the same principle where the crime rate is a dependent variable and the misery index and urbanization are employed as independent variables.

### Misery Index

The Okun's Misery Index (Okun, 1970) is commonly used to assess the wellbeing level of people because of its simplicity and easy understanding. It is the addition of unemployment and the inflation rate that illustrates the miserable condition in an economy. The general formation of the Okun's Misery index is given below:

$$OMI = \pi_t + \mu_t \text{-----} (1)$$

Where OMI stands for Okun's Misery Index,  $\pi$  is the inflation rate, and  $\mu$  represents the unemployment rate.

The Okun misery index is very simple, but it does not address some main economic components of the country. It is contended that the oversimplification sometimes misleads and exhibits limited views of the required phenomena. Therefore, there is a need to well address the remaining key economic components of a

country to better measure the misery level of the people. Where OMI stands for Okun's Misery Index,  $\pi$  is the inflation rate, and  $\mu$  represents the unemployment rate. The Okun misery index is very simple, but it does not address some of the main economic components of the country. It is contended that this oversimplification sometimes misleads and exhibits limited views of the required phenomena. Therefore, there is a need to well address the remaining key economic components of a country to better measure the misery level of the people.

**Hanke's Annual Misery Index (HAMI)**

The Misery index is an economic indicator that determines how the average person is doing. The misery index is a financial indicator that determines how well the average person is doing. Steve Hanke developed an alternative method to the OMI by introducing Hanke's Annual Misery Index (HAMI). This index combines several simple inputs to produce a simple, replicable measure of a country's misery level. It combines the long-term bank lending rate and the percentage change in real GDP per capita with OMI to provide an accurate picture of the problem. The researchers used the real interest rate as a proxy for the bank lending rate in this study. Hanke's Annual Misery Index is calculated as:

$$HAMI_t = \pi_t + \mu_t + BL_t - RGDP\%_t \text{-----} (2)$$

Where, HAMI is the Hanke's Annual Misery Index,  $\pi$  is inflation rate,  $\mu$  is unemployment rate, BL is bank lending rate and RGDP% is the percentage change in real GDP per capita. The study used real interest rate as a proxy for bank lending rate.

**Crime Rate**

In this study, the crime rate has been employed as a dependent variable and derived as the total number of crimes reported divided by the total population per ten thousand for the period 1990–2021 in Pakistan. Whereas, the total number of crimes is the amalgamation of various categories of crimes, such as killing of a human being, attempted murder, kidnapping, innocent-child lifting, robbery by a gang of armed dacoits, burglaries, cattle stealing, and other stealing. The crime rate is generally calculated as below:

$$Cr_t = \frac{\text{All Reported Crimes}_t}{(\text{Populations}_t / 10,000)} \text{-----} (3)$$

Where,  $Cr_t$  is the rate of crime, which is the part of all reported crimes to the populace per 10,000 individuals.

**Specification of Crime Function**

The general form of the crime function, which is used to probe the correlation among the misery-index, urban population and crime rate, can be illustrated as below: Where,  $Cr_t$  is the rate of crime, which is the sum of all reported crimes to the populace per 10,000 individuals. 3.3 Specification of Crime Function The general form of the crime function, which is used to probe the correlation among the misery-index, urban population, and crime rate, can be illustrated as below:

$$Cr_t = \alpha_0 + \sum_{i=1}^p \alpha_i X_{it} + \mu_t \text{-----} (4)$$

In this equation, CR is the number of crimes per 10,000 people in a year,  $X_i$  is the vector of explanatory variables in the crime model,  $\mu$  is the error term, and  $t$  is the time series subscript in the crime function.

**Model Selection**

The ARDL cointegration technique was developed by Pesaran and Shin (1999) and Pesaran et al. Pesaran and Shin (1999) and Pesaran et al., (2001) developed the ARDL cointegration method. Compared to other earlier and more recognized cointegration techniques, this methodology has many advantages. Firstly, using the ARDL order of integration at particular levels is not necessary. When the underlying variables are integrated to order 1, order 0, or, it may be applied. In the present research work, the variables are stationary at the first levels. Therefore, the researchers have employed the Auto Regressive Distributive Lag (ARDL) model, which is an appropriate procedure for analyzing the momentous effect of the misery index and urbanization on crime rate for the present time series investigation. The advantage of using ARDL is that it does not take

into account the problems arising from the different integration orders of the study variables. Examining the merits of the suggested methodology, similar techniques have been applied in previous studies like (Asghar et al., 2016; Daniel et al., 2016; Saboor et al., 2016; & Shah et al., 2022). One of the advantages of the ARDL model developed by Pesaran et al. (2001) is that it is applicable regardless of whether the variables under examination are stationary in the level, I(0), stationary in their initial difference, I(1), or mutually co-integrated. The second benefit of using ARDL is that, when dealing with small and finite sample sizes, it is relatively more efficient. The ARDL method's most significant advantage is that, by using this methodology, one can obtain unbiased estimates of the long-run model (Harris and Sollis, 2003).

**Crime Function in Econometric Form**

For the period 1990 to 2021, the Econometric Function of Crime Function shows the functional relationship between crime rate, HAMI, and the increase in the urban population in Pakistan. This function demonstrates the effect of HAMI and urbanization on the crime rate.

$$CR = \beta_0 + \gamma_1 HAMI + \gamma_2 URBN + \varepsilon_i \text{-----} (5)$$

Where,

CR= the rate of crime (per 10,000 people)

HAMI = Hanke's Annual Misery Index

URBN = Urbanization (urban population); $\varepsilon$  = error term and crime is dependent, while HAMI and urbanization are independent variables.

Hence, following Pesaran et al. (2001), the generalized ARDL (p,q) model is specified as:

$$Y_t = \gamma_0 + \sum_{i=1}^p \delta_i Y_{t-i} + \sum_{j=0}^q \beta_j X_{t-j} + \varepsilon_{jt} \text{-----} (6)$$

Where  $Y_t$  is a vector and the variables in  $(X_t)$  can be purely I(0) or I(1) or co-integrated;  $\beta_j$  and  $\delta_j$  are coefficients;  $\gamma$  is the constant and  $j = 1, \dots, k$  are optimal lag orders; and  $\varepsilon_{jt}$  is the vector of error terms with zero mean and constant variance which are serially uncorrelated or independent.

- The dependent variable is a function of its lagged values, as well as the current and lag values of the model's other independent variables.
- The lag-lengths for p and q may or may not be the same.
- The dependent variable is represented by the lags p.
- The exogenous variables are represented by the lags q.

**Results And Discussion**

The current study found a strong positive relationship between HAMI and Pakistan's crime rate. HAMI is a major cause of crime in Pakistan because it is a composite of inflation, unemployment, and bank lending rates less real GDP per capita growth. During the study period, the urban population was also found to be positively related to the crime rate. This positive relationship suggests that more urbanization may increase crime in the country. The reason behind it is that urbanization is an unplanned process that creates socioeconomic problems. The special focus of the government should be on infrastructure development. Policymakers could create some well-equipped and planned towns and districts to accommodate the growing urban population. These new colonies should have a better chance of generating employment opportunities and more capacity to absorb the rapid increase in urban populations. After getting no employment, people can adopt illegal ways to meet their basic needs and earn more money.

**Stationarity of the Data**

In economic research, the nature of time series is very important. Most time series entail so many statistical problems, which directly affect the findings of the study. Time series data has multiple issues that lead to biased as well as spurious results. For example, the problem of being stationary has been considered the most general and frequent problem. If a time-series is non-stationary, then before testing the data it is necessary to convert the data in such a way that it becomes stationary. Hence, since the present study is based on time series

data, it is important and necessary to corroborate the properties of stationarity for every variable discussed in the crime model. Many statistical tests and techniques are used to check the stationarity of the variables. The study at hand has used correlogram and Ljung-Box (LB) statistics, and has confirmed the existence of stationarity in the present time series. Gujarati (1999) explained that if the coefficients of autocorrelation (AC) go down or become smaller, then it can be resolved that the time-series is non-stationary. This phenomenon regarding the data used in this study has been presented in figure 4.1, where the values of A.C have decreased gradually. Furthermore, the majority of the spikes are outside the 95 percent confidence intervals, indicating the presence of non-stationary. In addition, the Ljung-Box test statistics also confirm that the corresponding probability value of the last Q-statistics is less than five percent, which has also verified the non-stationary crime rate. In the below figure, 4.1 correlogram and Ljung-Box (LB) statistics of crime rate have been shown, where the researchers have graphed the original annual data set that confirmed the nonstationarity of the data at this level. Therefore, for better and satisfactory results, the researcher has to convert the data into the first difference. Hence, the first difference of the crime rate has been taken as D(CRIME RATE) and presented in figure 4.2. After taking the first difference of the crime data, the coefficients of auto correlation have become smaller and lie within the given range. This is the only symptom that the variable crime rate has become stationary at first difference, while Figure 4.2 also confirms that no spike is outside the 95 percent confidence interval. In the same way, Ljung-Box confirms the entire story where the corresponding probability value (0.112) of the last Q-statistics 23.083 becomes greater than five percent (0.05). Thus, D(CRIME RATE) is now stationary and can be used for data analysis through ARDL, VAR, ARCH, GARCH VECM or any other econometric time series model.

**Table 4.1: Crime Rate at Level**

Date: 08/01/22 Time: 18:25  
Sample: 1990 2021  
Included observations: 32

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
		1 0.809	0.809	22.992	0.000
		2 0.660	0.013	38.772	0.000
		3 0.454	-0.242	46.510	0.000
		4 0.334	0.091	50.847	0.000
		5 0.185	-0.130	52.222	0.000
		6 0.131	0.108	52.943	0.000
		7 0.098	0.080	53.363	0.000
		8 0.149	0.141	54.369	0.000
		9 0.178	0.022	55.867	0.000
		10 0.210	-0.031	58.052	0.000
		11 0.173	-0.113	59.602	0.000
		12 0.113	-0.113	60.294	0.000
		13 -0.020	-0.184	60.317	0.000
		14 -0.123	-0.029	61.238	0.000
		15 -0.259	-0.136	65.523	0.000
		16 -0.324	-0.018	72.680	0.000

**Table 4.2: Crime Rate at first difference**

Date: 08/01/22 Time: 18:27  
Sample: 1990 2021  
Included observations: 31

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
		1 -0.130	-0.130	0.5764	0.448
		2 0.305	0.293	3.8512	0.146
		3 -0.144	-0.087	4.6086	0.203
		4 0.042	-0.073	4.6765	0.322
		5 -0.297	-0.261	8.1498	0.148
		6 -0.159	-0.249	9.1905	0.163
		7 -0.238	-0.174	11.604	0.114
		8 -0.047	-0.051	11.701	0.165
		9 -0.292	-0.328	15.652	0.075
		10 0.117	-0.109	16.315	0.091
		11 -0.039	-0.086	16.394	0.127
		12 0.290	0.064	20.924	0.051
		13 0.013	-0.067	20.933	0.074
		14 0.161	-0.204	22.489	0.069
		15 0.078	-0.071	22.883	0.087
		16 0.054	-0.066	23.083	0.112

**Table 4.3: HAMI at level**

Date: 08/01/22 Time: 18:28  
Sample: 1990 2021  
Included observations: 32

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	0.383	0.383	5.1474	0.023
		2	0.299	0.178	8.3814	0.015
		3	0.164	0.002	9.3917	0.025
		4	-0.082	-0.226	9.6508	0.047
		5	-0.164	-0.139	10.734	0.057
		6	-0.206	-0.066	12.518	0.051
		7	-0.295	-0.138	16.309	0.022
		8	-0.133	0.086	17.108	0.029
		9	0.085	0.259	17.453	0.042
		10	-0.014	-0.115	17.463	0.065
		11	0.263	0.186	21.039	0.033
		12	0.126	-0.132	21.900	0.039
		13	0.087	-0.050	22.334	0.050
		14	0.076	-0.025	22.679	0.066
		15	-0.061	-0.037	22.918	0.086
		16	-0.174	-0.057	24.976	0.070

Figure 4.3 presents the correlogram of HAMI at level where coefficients of autocorrelation are going down; all the spikes lie inside the two lines except one. Hence, the existence of stationarity in HAMI is confirmed, which explains that HAMI is now integrated at the first level, i.e.,  $I(0)$ . In the meantime, the corresponding probability value (0.070) of the last Q-statistics (24.976) is greater than (0.05) at the five percent level of significance and thus notifies that stationarity exists in the data at that level.

**Table 4.4: URBNP at level**

Date: 08/01/22 Time: 18:28  
Sample: 1990 2021  
Included observations: 32

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	0.902	0.902	28.535	0.000
		2	0.807	-0.033	52.141	0.000
		3	0.713	-0.046	71.219	0.000
		4	0.621	-0.046	86.200	0.000
		5	0.531	-0.047	97.547	0.000
		6	0.443	-0.047	105.74	0.000
		7	0.357	-0.046	111.30	0.000
		8	0.275	-0.046	114.72	0.000
		9	0.196	-0.046	116.54	0.000
		10	0.121	-0.047	117.26	0.000
		11	0.049	-0.047	117.38	0.000
		12	-0.019	-0.047	117.40	0.000
		13	-0.082	-0.047	117.79	0.000
		14	-0.141	-0.047	118.99	0.000
		15	-0.195	-0.046	121.42	0.000
		16	-0.244	-0.044	125.46	0.000



**Table 4.5: URBNP at first Difference**

Date: 08/01/22 Time: 18:00  
Sample: 1990 2021  
Included observations: 31

Autocorrelation		Partial Correlation		AC	PAC	Q-Stat	Prob	
	█		█	1	0.271	0.271	2.5107	0.113
	█		█	2	0.236	0.175	4.4710	0.107
	█		█	3	0.199	0.110	5.9172	0.116
	█		█	4	0.163	0.064	6.9202	0.140
	█		█	5	0.136	0.040	7.6465	0.177
	█		█	6	0.111	0.023	8.1521	0.227
	█		█	7	0.090	0.012	8.5008	0.291
	█		█	8	0.072	0.005	8.7344	0.365
	█		█	9	0.056	-0.001	8.8791	0.449
	█		█	10	0.039	-0.007	8.9530	0.537
	█		█	11	0.021	-0.014	8.9765	0.624
	█		█	12	0.002	-0.022	8.9768	0.705
	█		█	13	-0.018	-0.030	8.9948	0.773
	█		█	14	-0.039	-0.038	9.0854	0.826
	█		█	15	-0.059	-0.044	9.3101	0.861
	█		█	16	-0.078	-0.047	9.7269	0.880

The figure 4.4 correlogram & Ljung-Box (LB) URBNP has been shown, where the researchers have graphed the URBNP data set that confirmed the nonstationarity of the data at a level. The researcher has converted the URBNP data into the first difference and presented it in figure 4.5. After taking the first difference of the URBNP, coefficients of auto correlation have become smaller and lie within the given range. This is the one symptom that variable URBNP has become stationary at the first difference, whereas Figure 4.4 also confirms that most of the spikes are inside the 95 percent confidence interval. In the same way, Ljung-Box confirms the entire story where the corresponding probability value (0.880) of the last Q-statistics 9.7269 becomes greater than five percent (0.05).

**ARDL Statistics for Crime Model**

The tabulated results (Table 4.4.) demonstrate that the link between HAMI, urbanization, and crime rate is not spurious. The value of F-statistics for the bound test in the given model is 7.8887, which is greater than the upper critical bound value of 3.87 at the 5% level of significance. The null hypothesis of no co-integration is rejected at the 5% significance level. The result proposes that the crime rate is positively linked with HAMI & URBN. The Co-integrating Equation, i.e., CoinEq (-1) has the correct negative sign, i.e., (-1.2640). The t-value (-5.7222) also confirms that there is convergence from the short run to the long run amongst these variables during the study period. The result of the data analysis for the crime model also indicates that HAMI in Pakistan induces more crimes. It is because, as the rate of unemployment goes up, the available income-earning opportunities of individuals decrease, which prompts them to commit more crimes. In line, the expenses to become criminals fall down for unemployed-workers and as a result they become criminals. Similar positive associations between high rates of unemployment, soaring inflation, and increasing crime rates in the long run are examined by (Gillani et al., 2009; Lean & Tang, 2007; Tang & Lean, 2009). Similarly, rising inflation has had a crime-motivating effect on low-income holders by lowering their ethical threshold. Accordingly, soaring HAMI induces individuals to commit crimes. The present results are consistent with that of the research conducted by Khan and Saqib (2011); Munir et al.,(2017); Pirae and Barzegar (2011); Saboor et al. (2016); and Umair (2019) determined significant and positive relationships between crimes and misery index in the long-run. The result in (Table 4.4) explains that the demographic variable urbanization is significant with a positive sign. The result explains that as people straighten themselves out in the more

luxurious, i.e., urban areas, their total consumption expenditure will rise, and hence to overcome extra expenditure, the majority tends towards crime. As a result, higher urbanization has become a source of crimes in the country. The findings are consistent with (Galvin, 2002; Glaeser & Sacerdote, 1996; & Gumus, 2004), where, they found a positive association between urbanization and crime. The results presented in Table 4.4 show that HAMI is significant, which means that HAMI is more vulnerable both in the short and in the long run. It proves that HAMI influences the economic performance more badly by snatching the purchasing power of individuals in the form of high inflation, more unemployment. Consequently, the individuals facing high unemployment and inflation will become aggravated and will increase their criminal activities. In line with this, miserable conditions generated by high HAMI negatively affect individual behaviour and thus drive them to more criminal activities.

Table 4.4: The ARDL estimations for crime-model

Critical (F-test ) Bounds-Statistics	Significance Level		
	1%	2.5%	5%
Dependant variable: crime rate			
Lower Bound	4.13	3.55	3.10
Upper Bound	5.00	4.38	3.87
<b>Crime Model</b>			
ARDL specification	3,1,3		
F- stat	7.8887		
Level of Significance	Cointegrated at (5%)		
<b>ARDL Estimation of long run coefficients:</b>			
HAMI	0.2999 ( <b>4.0440</b> )		
URBNP	9.8600 ( <b>4.9090</b> )		
<b>Short run ECM estimates</b>			
D(HAMI)	0.1218 ( <b>3.0735</b> )		
D(URBN)	2.4500 ( <b>1.7589</b> )		
CointEg(-1)	-1.2640 ( <b>-5.7222</b> )		

Bold numbers in parenthesis are the values of t- statistics. Source: Researcher own calculations.

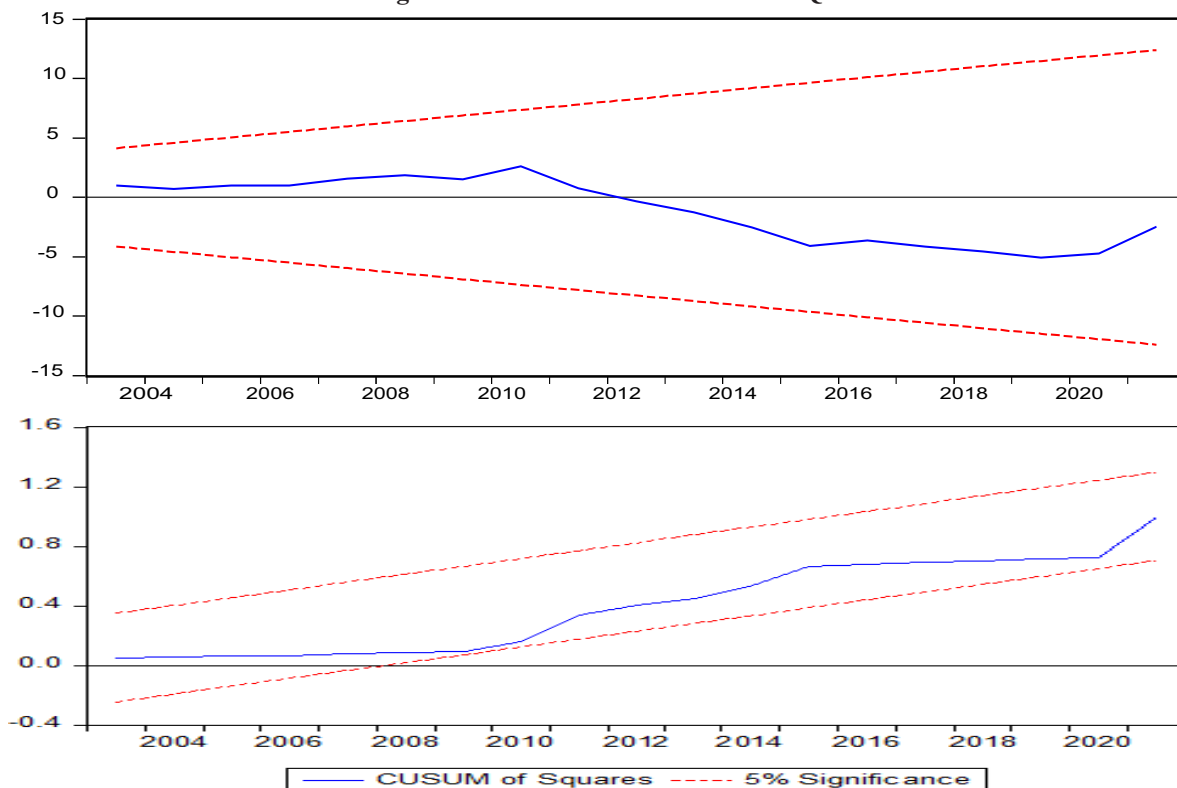
The present research work contributes to the available literature by presenting the strong economic relationship among economic misery, urbanization and crime rate. The estimated result signifies the existence of a positive relationship between an increase in HAMI and the crime rate. On the basis of the results presented in Table 4.4, it is concluded that a 1% rise in HAMI is connected with a boost in losses due to crimes by 0.3 criminals per 10,000 people in the long run. The given relationship is stable because the coefficients of HAMI are positive both in the short-run (0.2) and the long-run (0.3). The positive and significant results clarify that there is a need for strong and consistent policies to keep HAMI at a low level; otherwise, there will be a great loss to the nation in the shape of crimes. Similar positive results between misery index and crimes have been addressed in the studies like as Saboor et al., (2016) and Shah et al., (2022). Urbanization is also one of the emerging challenges faced by developing countries like Pakistan. Similar to HAMI, an increase in urbanization also brings an outsized increase in crime rates in the country. The results of the present study, presented in Table 4.4, illustrate that during the period of analysis, urbanization is positively linked to different types of crimes. The long-run result verifies that a 1% increase in

urbanization possibly increases more than 9 criminals per 10,000 people in Pakistan. The on-hand result is in favour of the studies taken by (Glaeser & Sacerdote, 1999; Haider & Ali, 2015) whereas it is against the results obtained by (Fajnzylber et al., 2002a) that explain that the intensity of urbanization does not have a significant effect on different types of crimes. The present research explores how increasing urbanization may accelerate crimes. In Pakistan, citizens shift from rural spheres to big cities in search of higher-earning jobs, where failure might turn to criminal activities. Similarly, urbanization may increase due to a lack of planning that result in a shortage of economic resources, which in turn inspires the community to become criminals.

**Structural Stability Test**

The model used in the present study is also subject to specification and diagnostic trials, which largely support the crime model. Simulations and graphs show that the predictive ability of the model is reasonable and the estimation results are reliable, which is mostly preferable to ARDL results. Different techniques are used like Cumulative Sum (CUSUM) and Cumulative Sum of the Squares (CUSUMSQ) to check the stability of the testable model. The diagrammatical appearance of CUSUM and the CUSUMSQ in Figure 4.6 confirms the stability of the model both in the long run and the short run. The graphs of CUSUM and CUSUMSQ shows that the graphical record of CUSUM and CUSUMSQ lies within the range of critical bounds (dashed lines) at 5 percent significance level which confirms that coefficients of parameters of are stable (Brown et al., 1975).

**Figure 4.6 CUSUM and the CUSUMSQ**



**Diagnostic Tests for Crime Model**

The current study presumes that the given data is free of serial-correlation and hetroskedasticity issues, and that the model is normally distributed. Various diagnostic tests, such as the Breusch-Goldfrey Lagrangian Multiplier (LM) test for detecting serial correlation, Ramsey's Reset test, Hetroskedasticity test, and Jarque-Bera Test for Normality, have been used to determine whether the model is appropriate or not. The results of diagnostic tests for the crime model are depicted in (Table 4.5).

**Table 4.5: Diagnostic test results for crime Model (1990-2021)**

<b>The Ramsey's Reset Test for Crime Model 2</b>		
H <sub>0</sub> : The crime function is specified.		
Ramsey Statistics	p-value	Result
0.2899	0.7752	Crime equation is specified in an accurate manner.
<b>Breusch- Goldfrey Serial-Correlation Lagrange Multiplier Test</b>		
H <sub>0</sub> : There is no serial correlation.		
B.G.S LM-stat	p-value	Result
0.3708	0.6956	In the crime model, there is no serial correlation.
<b>Test for Heteroskedasticity</b>		
H <sub>0</sub> : There is no Heteroskedasticity		
Glejser-stat	p value	Result
0.5998	0.7818	There is no heteroskedasticity.
<b>Normality test: The Jarque-Bera test</b>		
H <sub>0</sub> : Residuals are Normal.		
Jarque-Bera	p-value	Result
0.8613	0.6501	In a crime model, residuals are normally distributed.

Source: Researchers own calculations.

Ramsey's RESET test results (Table 4.5) confirm that the model has an accurate functional form because the probability value is just greater than 0.05. The LM residual test indicates that the variables are not serially correlated, as the current p-value is greater than 0.05. The p-value of 0.7818 in the Heteroskedasticity test is just greater than 0.05, indicating that the residuals are not heteroskedastic. Meanwhile, the Normality Jarque Bera (JB) test has a p value of 0.6501, which is much greater than 0.05, indicating that all of the model's residuals are normally distributed. Therefore, the diagnostic test results give explanations that the estimated crime function accomplishes all the requirements and that the predictable coefficients of the variables are stable during the study period. The empirical findings have been presented briefly and discussed how economic misery and urbanization affect the rate of crime in Pakistan. Interestingly, the Bound test result has recognized positive relationship among the explained and explanatory variables equally in the short-run and long-run. According to the findings, Hanke's annual misery index and urbanization coefficients are significantly positive, implying that a high misery index and an increase in urban population increase crime in Pakistan.

### Summary And Conclusions

Unfortunately, like in other developing countries, the crime rate in Pakistan has risen over time due to a variety of factors such as economic and social unrest, as well as poor law and order situations. The study was conducted to look at the crime rate, economic misery, and urbanization in Pakistan. Secondary data was obtained for this study from the Federal Bureau of Statistics, World Development Indicators, and several yearly handbooks of Pakistan's economic survey from 1990 to 2021. However, data on the crime rate has been obtained from Pakistan's Bureau of Police Research and Development. The researcher employed a 31-year sample for the crime model in this empirical investigation. In the present study, all the variables were statistically significant and exhibited accurate indications. The research at hand has emphasized the role of multiple variables in determining crime rates and highlighted the significance of the factors affecting crime over short and long periods of time in Pakistan. The study used the Crime Model to examine the influence of HAMI. Moreover, urbanization has been used as a sub variable in combination with HAMI. The ARDL bound testing method was used to check the dependency of the crime rate on HAMI and the urban population. On the other hand, the stationarity problem, on the other hand, was investigated using the correlogram and

Ljung-Box (LB) statistics, and it was found that the crime rate and urban population are stationary at first difference, whereas HAMI is stationary at level. The ARDL result for the Crime Model describes the significant positive impact of HAMI and urbanization on the crime rate. This clarifies that there are both long and short term connections among crime rate, HAMI and urbanization. The findings of the study also showed that increasing HAMI in Pakistan leads to an increase in crimes. It is because during the period of economic hardships, unemployment rises, income generating opportunities decrease, and, consequently, it motivates individuals to commit more crimes. On the other hand, urbanization is statistically significant with a positive sign. This means that when people migrate to urban areas, their spending habits may change (increase) and lead to criminal activity. As a result, urbanization becomes a source of illegal activities in society. The present results are consistent with that of the research conducted by Saboor et al. (2016), where they found positive non significant result for BMI while, positive significant result for OMI in Pakistan; Whereas, Pirae and Barzegar (2011); Shah et al. (2022) determined significant and positive relationships between crimes and misery index in the long-run. In line Inbaraj, (2010); Tang and Lean (2009); Wang (2019) have also analyzed and found significant positive long run relationship between various types of crimes and misery-index.

### Policy Implications

The present study opens new insights for policymakers and the government. The boost in urban populations and the high misery index increase crimes that have brought social and economic unrest in society. On the bases of the study result, the subsequent suggestions are formulated to put off crimes; control urbanization and keep lower the misery index. First, drastic steps are needed to decrease inflation and unemployment, keep lower bank lending rates, and increase GDP per capita so that economic misery may decrease. That might further lower the crime rate in the country. Second, policymakers may suggest suitable measures that reduce urbanization. However, it is important for the government to provide financial incentives, better infrastructure, and better medical facilities to the rural community. Likewise, new towns and homes need to be built up where the rural population can adjust without any difficulty. The following suggestions may help the government in deriving such policies and measures that might help in decreasing urbanization and lowering economic misery, which further may decrease crime in the country.

1. To mitigate the crime rate, key economic determinants of crime like economic misery need to be effectively addressed by policy-makers.
2. It is imperative to discourage the soaring urbanization factors; thereby reducing the overwhelming crime rate in the country. All this is only possible through improving the living standards of the rural population in the country.

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