

## **An Analysis of the Interrelationship among Crime, Misery Index and Institutional Quality: A Case Study of Pakistan**

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### **Abstract**

*The study investigates the impact of misery, institutional quality, human capital, population density and GDP per capita on crime in Pakistan over the period 1984 to 2015. The misery index is constructed and Johansen and Juselius test of co-integration is employed to check long run relationship among variables. VECM is used to explore short run and long run dynamics and Toda Yamamoto causality test for causal relationship. Results confirm significant long run relationship among crime and its determinants in Pakistan. Two channels of bidirectional causality are found active with human capital from GDP per capita and governance. Unidirectional causality runs from crime to misery and from misery to institutional quality. The study concludes that misery and poor quality of institutions have been contributing to higher crimes statistics in Pakistan for last three decades. Therefore, government should take steps to reduce misery and to improve institutional quality to mitigate criminal activities in Pakistan.*

**Keywords:** crimes, misery index, institutional quality, Johansen co-integration

### **Introduction**

One of the most undesirable situations in any society is crime. In recent years crime has become a blistering issue particularly for developing countries. Despite of different policy measures taken by the authorities for controlling crimes it has been observed that with the passage of time crime has reached at alarming level in these countries and it has exerted bad impact on the economic performance of these counties. Several studies are available in the literature that has identified several social, political and economic factors responsible for crime in developed and developing countries. (see for example, Finklea (2011), Zaleski (1990), Wiseman (1992), Di Tella et al (2001, 2003), Welch (2007,2008), Lee et al (2014)). Becker (1968) and Ehrlich (1973) proposed unemployment crime hypothesis in which they postulated that there exists positive relationship between unemployment and crime rate. Smith et al (1992), Devine et al (1988) Teles (2004), Carmichael and ward (2001) and Tang (2009), find positive relationship between inflation and crime.

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The existing literature have revealed that factors like inflation, unemployment, income inequality, law and order, bad governance and corruptions, poor institutional quality, political instability are responsible for crime. Maddah (2013), Sadehi et al (2014) and Ali et al (2015) have analyzed the relationship between income inequality and crime. Levitt (1997), Ugar and Dasgupta (2011) and Aron (2000) throw light on the role of institutions in controlling crime. Furthermore, some studies have stressed that income disparity and social backwardness are mostly responsible for high crime rate in developing countries like Pakistan as these factors motivate deprived people to commit crime such as burglary, murder, kidnapping and assault.

Pakistan being a developing country is facing a rising trend of crime since 1984. Crime has attracted a lot of attention of researchers and policy makers and a considerable amount of research is available in the literature on crime in Pakistan which has identified different reasons for an increase in crime rate in Pakistan over time. These factors include high unemployment rate, soaring prices of food and raw materials, income disparity, rising population, fluctuation in interest rate, corruption, lawlessness and poor human resource management. The trend of total number of reported crime in Pakistan since 1984 is presented in figure 1.

**Figure 1: Crime Trend in Pakistan (1984-2015)**

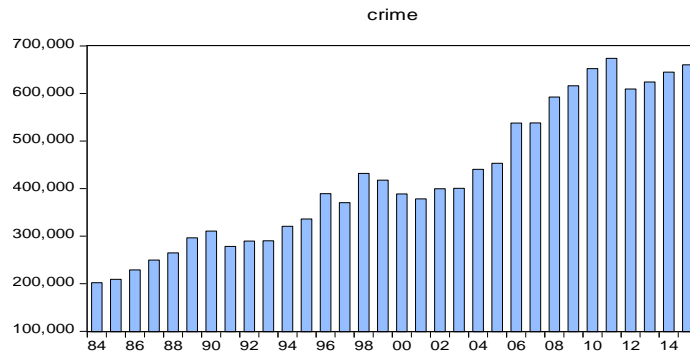


Figure 1 indicates the existence of worse situation of crime in Pakistan for the last 3 decades. The research indicates that immense increase in crime in Pakistan is associated with increasing prices and high unemployment. It has exerted bad impact on the security of individuals, businesses and public institutions. Furthermore, crime has appeared to be an active tool for financing terrorist activities in Pakistan as many terrorist organizations have been involved in robberies and ransom and this money has been used in committing terrorist activities in the country. It has reduced not only the writ

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of the government in some areas of the country but also has affected Foreign Direct Investment (FDI) adversely which have retarded the process of economic development in the country.

Pakistan scored 42<sup>nd</sup> positions in ranking of World Misery Index 2014 where lesser score shows worse and greater value means better condition of misery. In 2013, Pakistan appeared among the top of one-third nations that were most miserable due to of high interest rate, high unemployment, rising corruption and poor law and order situation. Furthermore, bad governance is also regarded as responsible for stagnant economic situation in the country and is also responsible for high crime rate in Pakistan as bad governance increases poverty, misery and promotes criminal activities. In Pakistan poor quality of governance is attributed to clumsy and corruptible political leadership, fostering systems and institutions hampered by the interference of political leaders and interest group along with non-merit selections. Table 1 reports five years averages along with percentage change of institutional quality in Pakistan for the period 1984 – 2015.

**Table 1: Trend of Institutional Quality (1984-2015)**

Year	Institutional Quality	Percentage Change
1984-90	0.35	---
1991-95	0.38	0.08
1996-00	0.48	0.26
2001-05	0.41	-0.14
2006-10	0.43	0.04
2011-15	0.46	0.06

From Table 1 it can be observed that for the period 1984-2000 institutional quality index values have shown rising trend with positive percentage change. It indicates that institutional quality level has improved during this time period as there was democratic regime in Pakistan during this period which has improved the political stability in the country. As a result an improvement in accountability, provincial autonomy, independence of judiciary and legislation has been observed in the country. Furthermore, after the 18<sup>th</sup> amendment the

institutions become independent which helped in improving the quality of institutions.

Numerous studies are available on crime in Pakistan and these studies have pointed out several economic, political and social factors responsible for crime in Pakistan. However, a limited research has been conducted on the role of institutions in controlling crime in Pakistan. The present study is an attempt to analyze the impact of institutional quality and misery index on crime in Pakistan. The present study is valuable addition to the existing literature as it uses newly constructed misery index in econometric analysis which includes real interest rate instead of nominal interest rate which reduces the redundancy problem of variables through avoiding the double counting of inflation.

## II. Review of Literature

The present study is an attempt to analyze the interrelationship among crime, misery index and institutional quality in Pakistan. The literature indicates that many researchers have used misery index to analyze its relationship with crime and misery index has appeared an important factor responsible for crime particularly in developing countries like Pakistan. Barro (1999) constructed Barro Misery Index (BMI) which includes nominal interest rate and GDP. Many economists checked the validity of misery index like Zaleski (1990), Wiseman (1992), Lee et al (2008), Blanchflower et al (2013) and Cohen et al (2014). Some of the recent researches attribute crime to misery index and point out that it is one of the important factors which contributes to crime and is assumed to create economic and social cost to a society. Gillani et al. (2009), Inbaraj (2010), Ruprah and Luengas (2011), Nunley et al. (2011), Pirae and Barzegar (2011), also found long run relation between crime and misery index.

The relationship between misery index and crime is an important era of debate among the economists. One of earliest views was presented by Becker (1968) and Ehrlich (1973) who proposed unemployment crime (U-C) hypothesis in which they postulated that there exists positive relationship between unemployment and crime rate. Several studies have investigated unemployment-crime hypothesis (for details see Ehrlich (1973) and Smith et al. (1992), Fleisher (1966), Tsushima (1996), Saridakis and Spengler (2009) and Raphael and Ebmer (2001), Gould et al. (2002) Maddah (2013).

Several studies are available in the literature which shows the existence of positive relationship between inflation and crime rate (For detail, see Smith et al (1992) Devine et al (1988), Teles (2004), Tang (2009)). The results of these

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studies reveal that inflation reduces the purchasing power of individuals which makes it difficult for them to maintain their standard of living. As a result people are motivated in engaging them in illegal means to meet their both ends.

The existing research work on crime highlights the importance of income disparity and social backwardness as determinants of crime. Income inequality is an important factor that motivates people to commit crime as they try to reduce wage differences through indulging in crime like burglary, murder, kidnapping and assault. Empirical evidence on relationship between inequality and crime yield mixed results. Numerous studies find strong positive relationship between income inequality and crime like Allen (1996), Chiu and Madden (1998), Kelly (2000), Fajnzylber et al. (2002), Nilsson (2004), Bouzat (2010), Maddah (2011) Izadi and Piraei (2012) and Rufrancos et al. (2013) while some other studies find a weak or nonexistence of relationship between inequality and crime like Neumayer (2005). Burch (2007) confirms that inequality in income increases crime rate in cross sectional data but time series analysis do not support this positive relation. Sadeghi et al. (2014) tried to investigate the relationship between Misery Index and income inequality in Iran and confirm Kuznet Hypothesis which indicates the existence of positive relationship between misery index and income inequality.

Tang (2009) investigated the impact of inflation and unemployment on crime rate in Malaysia and confirmed long run correlation of crime and its determinants. Tang and Lean (2009) suggested the use of Misery index instead of using unemployment and inflation variables separately to avoid multi co-linearity problem. They examined the impact of misery index on crime in US during 1960 to 2005 and confirmed co-integration among variables. Furthermore, study pointed out that although misery index positively and significantly affects crime but motivational effect of crime has dominated the opportunity effect of crime in long run during the analysis period.

Several studies have investigated the relationship between crime and institutional quality. Messner and Rosenfeld (1997) asserted that a welfare state can become a generous and wide when it experiences low crime rate and succeeds in reducing the effects of crime in the form of inequality, insecurity and uncertainty through various tools. The study found negative relationship between crime and social welfare spending. Becker and Mulligan (1997) found that education teach individuals to be more patient and thus discourages them to commit crime as they place greater weights on expected future punishments. Lafree (1998), Buscaglia E. (2003) identified the negative relation between institutional quality and crime. Lochner (2004) tried to analyze the relationship between human capital and crime and found the

existence of negative relationship between education and crime. Accordingly, wages and opportunity cost played key role in thriving crimes. The result of the study revealed that aged, skilled and literate people are found to be less engaged in crimes as they can earn high wages. The study concluded that quality education leads to employment opportunity, stable family system and bringing up more productive citizens.

Blanco (2013) discussed the relationship between crime and trust of people in institutions and pointed out that negative association existed in crime and institutional trust in Mexico and Columbia. The study concluded if people have no trust institutions, they are less likely to report crime and as a result crime rate may increase. Low quality of institution and less civic participation lead to less social capital which results in low rate of economic growth. Barlett et al. (2013), Wright et al. (2013), Robinson (2015) and Blanco et al. (2015) found same negative relationship between institutional structure and crime.

Cheema and Atta (2014) examined the determinants of unemployment in Pakistan during 1973- 2010 by employing ARDL approach. The analysis revealed the significance of unemployment in increasing output gap, positive contribution of productivity in raising output level and the adverse impact of uncertainty (misery index) on the process of economic growth in Pakistan.

Haider and Ali (2015) examined the contribution of population density, education, unemployment, industrial growth and foreign remittances in crime in Punjab (Pakistan) at district level and found positive and statistically significant relation of population and unemployment with crime but inverse relationship in case of education and remittances.

Khan et al. (2015) examined the effect of unemployment, per capita income, poverty and literacy rate on crime in Pakistan during the period 1972 - 2011. The study pointed out positive link of unemployment with crime and negative relationship between education and crime. Ahad (2016) analyzed the effect of income disparity, poverty and high prices on crime in Pakistan during 1984 to 2012 by employing ARDL approach. Results established long run relationship among the variables and confirmed positive and significant impact of poverty, income disparity and high prices on crime rate in Pakistan and income inequality appeared to be significant determinant of crime in short run.

Asghar et al. (2016) tried to identify the political, social and economic factors responsible for crime in Pakistan. The study used annual data for the period 1984-2013 and employed ARDL approach for estimation purpose. The results of the study revealed that social political and economic factors significantly affect crime in Pakistan. Law and order corruption were responsible for high

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crime rate in Pakistan for the last two decades. The results of the study confirmed the existence of negative relationship between government stability and crime. Furthermore, income disparity, high population, rising poverty and poor human capital promoted crime rate in Pakistan.

The study stressed on the need to strengthen the law enforcing agencies for controlling crime in Pakistan.

From the above discussion it can be concluded that institutional quality and misery index are important factors responsible for crime in developing countries. Not many studies are available on the relationship between misery index, institutional quality and crime in Pakistan. This brings up the need of conducting more research on crime so that an increase in crime over time can be tackled properly in the country. The present study is an attempt to analyze the relationship between institutional quality, newly constructed misery index and crime in Pakistan. The results of the study will be helpful for the policy makers to formulate and implement appropriate policies for tackling the rising crime rate in Pakistan.

### **III – The Data, Model Specification and Econometric Methodology**

#### **The Data**

The present study is based on single equation model. The study uses annual data of Pakistan over the period 1984 to 2015 which is collected from various issues of Pakistan Economic Survey, Pakistan Statistical Year Book, World Development Indicators (WDI), International Country Risk Guide (ICRG), International Financial Statistics (IFS), Federal Bureau of Statistics (various issues) and The Standardized World Income Inequality Database (Solt, 2014). Principal Component Analysis (PCA) has been used for constructing misery index which includes inflation rate, unemployment rate, real interest rate and income inequality.

The index is formed as a linear combination of variables which assumes the form;

$$Pc = a_{11}x_1 + a_{12}x_2 + a_{13}x_3 + a_{14}x_4$$

Where  $a_{11}$ ,  $a_{12}$ ,  $a_{13}$  and  $a_{14}$  are weights of the first component of each variable and  $x_1$ ,  $x_2$ ,  $x_3$  and  $x_4$  represents the variables.

In order to overview the properties of data, descriptive statistics is presented in Table 2.

**Table 2: Descriptive Statistics (1984-2015)**

	Crime	MI	IQ	HK	POP	GDPPC
Mean	12.889	14.205	0.425	2.687	177.96	640.50
Median	12.885	14.693	0.439	2.750	177.33	614.67
Maximum	13.420	27.000	0.546	3.400	245.05	815.22
Minimum	12.216	6.103	0.270	2.000	115.69	458.58
Std.dev.	0.362	4.591	0.055	0.387	38.434	107.48
Skewness	-0.099	0.325	-0.575	0.123	0.074	0.145
Kurtosis	1.931	3.347	3.737	1.886	1.853	1.801
Jarque-Bera	1.574	0.725	2.491	1.735	1.781	2.027
Probability	0.454	0.695	0.287	0.419	0.410	0.362
Sum	412.47	454.57	13.625	86.00	5694.74	20496.2
S.S.Dev.	4.080	653.40	0.094	4.655	45794.50	358159.2
Observations	32	32	32	32	32	32

### Model Specification

The journal form of single equation model has been used to captures the impact of misery, institutional quality, human capital, population density and GDP per capita on crime in Pakistan. The model may be written in linear form as:

$$\text{Incrime} = \beta_0 + \beta_1 \text{Lnmi} + \beta_2 \text{Lniq} + \beta_3 \text{Lnhk} + \beta_4 \text{Lnpop} + \beta_5 \text{Lngdppc} + \mu_1$$

(+)   (-)     (-)     (+)     (-)

Ln crime = log of total number of reported crimes

Lnmi = log of misery index

Lniq = log of institutional quality

Lnhk = log of human capital calculated as education expenditures as a percentage of GDP + health expenditures as a percentage of GDP.

Lnpop = log of population density per square kilometer

Lngdppc = log of GDP per capita



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The prior expectations about theoretical signs of the variables are given in the parenthesis.

### IV- Econometric Methodology and Empirical Results

#### Unit Root Tests

The pre-requisite to estimate the model is to check the stationarity of the variables as traditional econometric theory states that variables should have constant mean and variance. In order to check the stationarity of the series, three unit root tests are performed: Augmented Dickey Fuller (ADF), Kwiatkowski-Phillips-Schmidy-Shin (KPSS) and Dickey Fuller Generalized Least Square (DF-GLS) tests. All tests are performed with the inclusion of trend and intercept as well as without inclusion of trend. The results indicate that all the variables are integrated of order 1. The results are presented in Tables 3.

**Table 3: ADF, KPSS and DF - GLS Test Statistics Results (1984-2015)**

Variables	ADF test Statistic		KPSS test Statistics		DF-GLS		Order Of Integra-tion
	H <sub>0</sub> : Variable is not Stationary		H <sub>0</sub> : Variable is Stationary		Level		
	Consta-nt	Constant and Trend	Const-ant	Constant and Trend	Intercept	Intercept and Trend	
Lcrime Δlcrime	1.38 -3.10**	-2.56 -3.78**	0.88 0.10**	0.31 0.05**	0.07 -3.17*	-2.49 -3.23**	I(1)
Lmi Δlmi	-1.72 3.04**	-1.59 -4.80*	2.37 0.15**	2.46 0.09**	-1.75 -3.01*	-1.85 -3.31**	I(1)
Liq Δliq	-1.36 -3.52**	-2.08 -3.58**	1.36 0.19**	0.23 0.08**	-0.47 -2.41**	-2.20 -4.04*	I(1)
Lhk Δlhk	-1.88 -4.12*	-2.80 -4.01**	0.79 0.18**	0.22 0.11**	-1.36 -2.38**	-2.08 -3.45**	I(1)
Lpop Δlpop	1.29 -3.02**	-2.01 -4.18**	3.17 0.64*	0.73 0.14**	1.44 -2.05**	-1.20 -4.13*	I(1)
Lgdppc Δlgdppc	-0.94 -3.06**	-2.55 -3.60**	0.89 0.15**	1.27 0.08**	0.14 -2.75*	-2.47 -3.62**	I(1)

ADF stands for Augmented Dickey Fuller, KPSS stands for Kwiatkowski-Phillips-Schmidy-Shin Test, and DF-GLS stands for Dickey Fuller Generalized Least Square. Δ is used as difference operator. \* And \*\* denotes 1% and 5% level of significance respectively.

**Co-integration Results**

Since all the variables included in the model are I (1) it indicates that Johansen's and Juselius co-integration test is appropriate for analyzing the long run relationship between the variables. By using VAR model the optimal lag length based on AIC and SBC is determined. The results show that optimal lag length for the model is 1. The trace statistics and maximal eigen value results reveal that there are four co-integrating vectors for the variables in the model at 5% level of significance. This indicates that there exist four co-integrating equations that provide empirical support for long-run equilibrium relationship among the variables included in the model. The results of Johansen's and Juselius co-integration test are presented in Table 4.

**Table 4: Johansen's and Juselius Co-integration Results (1984-2015)**

**Dependent variable: Crime Rate (Total number of reported crime to the police)**

Hypothesized	Trace Statistic	Critical Value (5%)	Prob.**	Maximum Eigen Statistic	Critical Value (5%)	Prob.**
No. of CE(s)						
None	198.05*	95.75	0.00	80.27*	40.07	0.00
At most 1	117.77*	69.81	0.00	44.18*	33.87	0.00
At most 2	73.58*	47.85	0.00	31.07*	27.58	0.01
At most 3	42.51*	29.79	0.00	28.80*	21.13	0.00
At most 4	13.70	15.49	0.09	13.54	14.26	0.06
At most 5	0.16	3.84	0.68	0.16	3.84	0.68

\* Denotes rejection of null hypothesis at 5% level of significance.

The results of normalized co-integration equation that give information about long run relationship between the variables are presented in Table 5.

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**Table 5: Normalized Co-Integrating Coefficients**

Lcrime	Lmi	Liq	Lhk	Lpop	Lgdpppc
1.00	- 0.387	1.992	0.673	- 3.023	3.983
S.E.	0.108	0.497	0.430	0.904	0.899
t-value	3.559	4.005	1.564	3.344	4.430

All variables have their expected signs and are statistically significant except human capital. The significance level of variables varies from variable to variable. The estimated long run crime function is presented below:

$$\begin{aligned}
 \text{Lcr} = & \mathbf{0.387} \text{ Lmi} - \mathbf{1.992} \text{ Liq} - \mathbf{0.673} \text{ Lhk} + \mathbf{3.023} \text{ Lpop} - \mathbf{3.983} \text{ Lgdpppc} \\
 & \text{t-value} \quad \mathbf{(3.55)} \quad \mathbf{(4.00)} \quad \mathbf{(1.56)} \quad \mathbf{(3.34)} \quad \mathbf{(4.43)}
 \end{aligned}$$

According to normalized equation, misery index positively and significantly affects crime with an elasticity of 0.387. The coefficient suggests that 1 percent increase in misery index, on average, leads to 0.387 percent increase in crime rate in the long run. The coefficient of institutional quality is negative and statistical significant at 1 percent that supports our theoretical expectations. The coefficient of human capital is -0.673 which negatively affects crime rate but it is statistically insignificant or marginally significant at 10 percent level of significance. With regard to long run parameter of population density, we find that size of population is also an important factor to increase crime rate. The long run parameter of population is 3.023 and it is statistically significant at 1 percent level. The long run coefficient of GDP per capita is statistical significant at 1 percent level and is negatively associated with the crime.

**Vector Error Correction Model (VECM)**

After establishing co-integrating relationship between the variables, VECM is considered as an appropriate technique for obtaining information about causal factors affecting the variables included in the model. The results of VECM are reported in Table 5.

**Table 5: Vector Error Correction Model Output (1984-2015)**

Part A						
Variable	D(lcrime)	D(lmi)	D(liq)	D(lhk)	D(lpop)	D(lgdppc)
Constant	2.436* (3.273)	0.773 (0.144)	-0.853 (-0.777)	-4.565* (-4.108)	0.005* (2.191)	0.037 (0.135)
D(lcrime <sub>t-1</sub> )	-0.330* (-1.886)	-0.605 (-0.477)	0.322 (1.243)	0.594* (2.269)	0.000 (1.432)	-0.008 (-0.133)
D(lmi <sub>t-1</sub> )	-0.089* (-2.097)	0.182 (0.587)	0.004 (0.058)	0.067 (1.044)	-0.000 (-1.089)	0.010 (0.639)
D(liq <sub>t-1</sub> )	-0.358* (-2.159)	0.086 (0.071)	0.031 (0.125)	0.022 (0.089)	-0.000 (-1.642)	-0.082 (-1.324)
D(lhk <sub>t-1</sub> )	-0.245* (2.027)	0.248 (0.284)	0.099 (0.556)	0.123 (0.682)	0.000 (0.763)	-0.077 (-1.709)
D(lpop <sub>t-1</sub> )	-97.361* (-3.201)	-0.30.37 (-0.138)	34.921 (0.778)	185.95* (4.094)	0.768* (7.910)	-1.125 (-0.099)
D(lgdppc <sub>t-1</sub> )	-0.417 (-0.757)	-1.944 (-0.488)	-1.413 (-0.174)	0.882 (1.071)	0.000 (0.273)	0.528* (2.567)
(ECT <sub>t-1</sub> ) <sub>1t</sub>	-0.702* (-2.984)	1.033 (0.607)	-0.504 (-1.451)	-1.122* (-3.192)	-0.002* (-2.193)	-0.093 (-1.054)
Part B						
R <sup>2</sup>	0.77	0.23	0.30	0.69	0.99	0.49
F-statistic	6.39					

\*, \*\* and \*\*\* denotes 1%, 5% and 10% level of significance respectively.

A negative and significant Error Correction Term (ECT) is an indication of co-integration among the variables and the presence of a stable long-run equilibrium path. The value of lagged Error Correction Term (ECT<sub>t-1</sub>)<sub>1t</sub> carries negative and significant coefficient as reported by t-value (-2.98). This shows that there exists long run relationship between crime and misery, institutional quality, human capital, population and GDP per capita. The coefficient of lagged error correction term is -0.702 that describes speed of adjustment towards long run equilibrium and implies that 70 percent of the dis-equilibrium, on average, is corrected in the next year. The value of R<sup>2</sup> is 0.77 which shows that 77 percent of variations are explained by independent variables. F-statistics is 6.39 which show overall significance of the model and the value of F-stat is significant at 5 percent.

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**Toda Yamamoto Causality Results**

**Table 6: Toda Yamamoto Causality Results (1984-2015)**

Dependent Variable	Sources of Causation					
	Lncrime	Lniq	Lnmi	Lngdppc	Lnhk	Lnpop
	Mwald test ( $t^2$ )	Mwald test ( $t^2$ )	Mwald test ( $t^2$ )	Mwald test ( $t^2$ )	Mwald test ( $t^2$ )	Mwald test ( $t^2$ )
Lncrime	---	1.09 (0.29)	1.24 (.26)	0.12 (.73)	0.09 (0.76)	0.32 (0.57)
Lniq	1.12 (0.28)	---	8.59 (0.003)*	0.97 (0.32)	4.48 (0.03)**	8.81 (0.003)*
Lnmi	3.85 (0.04)**	0.47 (0.48)	---	0.36 (0.54)	0.0001 (0.98)	1.05 (0.30)
Lngdppc	5.89 (0.01)*	2.94 (0.08)***	16.95 (0.000)*	---	8.73 (0.003)*	0.78 (0.37)
Lnhk	14.33 (0.0002)*	4.90 (0.02)**	3.55 (0.05)**	6.14 (0.01)*	---	2.72 (0.09)***
Lnpop	0.34 (0.55)	1.31 (0.25)	1.66 (0.19)	2.27 (0.13)	0.22 (0.63)	---

\*, \*\*, and \*\*\* indicate significance at the 1%, 5% and 10% level, respectively.

Toda Yamamoto causality results are reported in Table 6 where statistics of modified Wald test probabilities of ( $t^2$ ) are given. Optimal lag length 1 based on Schwartz and Akaike information criterion is determined as one. The order of integration of all the series is 1 confirmed through ADF, DF-GLS and KPSS unit root test. The study estimated VAR with 2 lags by seemingly unrelated regression estimation method as  $k + dmax = 2$ . In order to check restrictions on the parameters we have applied Wald test only on first k coefficients in the model.

The result of first equation shows that no causality exists among the variables or absence of causality. In case of second equation, we find two unidirectional causalities running from misery and human capital to institutional quality. Third equation describes a unidirectional causality running from crime to misery. Fourth equation has four causalities running from crime, misery index, institutional quality and human capital towards GDP per capita. The results of fifth equation reports that all factors affect human capital as we find 5 unidirectional causalities running from crime, misery index, institutional quality,

GDP per capita and population towards human capital. In case of sixth equation, we find absence of causality.

Out of these 13 unidirectional causalities we have found 2 bi-directional causalities which are found between institutional quality and human capital. This indicates that human capital affects institutional quality and in turn improvement in institutional quality has an impact on human capital.

**Diagnostic Test**

In order to check the validity of fitted model following diagnostic tests are applied:

**Table 7: Diagnostic Test Results (1984-2015)**

Ramsey's Reset Test H <sub>0</sub> : Equation is Correctly Specified		
Ramsey-stat	p-value	Result
1.09	0.34	Equation is correctly specified
Serial Correlation LM Test H <sub>0</sub> : No Serial Correlation		
LM-stat	p-value	Result
1.54	0.23	There is no serial correlation
Hetro-skedasticity Test H <sub>0</sub> : No Hetro-skedasticity		
Arch-stat	p-value	Result
1.16	0.29	There is no hetro-skedasticity
Jarque-Bera Test H <sub>0</sub> : Residual are Normal		
Jarque-Bera	p-value	Result
1.76	0.41	Residuals are normally distributed

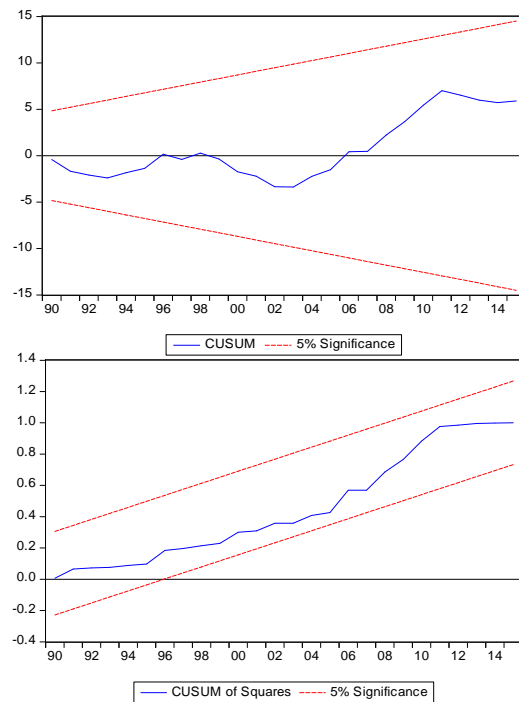
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The estimated results of Ramsey's RESET test confirms that the model has correct functional form as p-value is greater than 0.05. Lagrange multiplier test (LM test) of residual serial correlation shows that there is no serial correlation among the variables as probability value is greater than 0.05. Heteroskedasticity test results indicate that there is absence of heteroskedasticity as p-value is greater than 0.05. Normality test of Jarque Bera (J-B) also has 0.4 probability value which is greater than 5 percent and thus indicates that residuals are normally distributed. From the above mentioned discussion it can be concluded that estimated parameters of the model are accurate and are useful for policy measures as all diagnostic tests confirm the validity of the model.

### Model Specification Test

The stability tests provide information regarding the stability of estimated model of crime over time or stability of the parameters of the model. The visual presentation of Cumulative Sum (CUSUM) and the Cumulative Sum of the Squares (CUSUMSQ) tests are given in Figures.

**Figure 2: CUSUM and CUSUM Square Plots**



These result shows that Cumulative Sum (CUSUM) and Cumulative Sum of the Squares (CUSUMS Q) lies between the two critical lines which indicate that the estimated model is stable over time.

## **V- Conclusion and Policy Recommendations**

For the last few decades, Pakistan has been experiencing massive criminal activities. The recent spike in the frequency and scale of terrorist and non-terrorist crime in Pakistan is damaging smooth functioning of institutions, breaking down social structure, crippling economic growth, lowering foreign and domestic investment and worsening law and order situation in the country. Furthermore, terrorism, corruption and violent crimes have increased insecurity among the individuals which is interrupted smooth functioning of developmental activities in the country. There can be a number of economic, social and political factors responsible for these criminal activities.

Keeping in view the results present study is an effort to explore the impact of misery and institutional quality on crime rates in Pakistan. The results of the study reveal that there is positive and statistically significant relationship between misery index and crime rate. High rate of inflation, unemployment, real interest rate and income disparity force individuals to adopt illegal means in order to fulfill their needs. Institutional quality has negative and statistically significant relation with crimes, which indicate that institutions are the bodies enforced with powers to influence the criminal behavior through various political, social, economic and legal procedures.

The results of the study also suggest that improvement in human capital can reduce the crime rate as negative relation exists among human capital and crime in long run. Improvement in human capital means higher wage rate and lower misery that lowers the expected utility from crimes and it establishes negative relation of human capital with crime. The argument in favor of this result seems to be closer to the conditions prevailing in Pakistan. Moreover, population have positive and significant relation with crime in Pakistan as it brings urbanization, scarcity of economic resource, management issues and high demand of goods along with poor supply. The result indicates that GDP per capita exerts negative and statistically significant influence on crime rate in long run. The results of causality test have established two bidirectional and nine unidirectional causal relationships which is an indication of the existence of the relationship among the variables included in the model.

From the above discussion it can be observed that misery and poor governance contribute to crimes in Pakistan and these variables are also interrelated to each other.



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In order to inhibit crime there is need to alleviate misery of the people through different projects, programs and skill development opportunities. Due to motivational effect as suggested by misery index, crime rate can be reduced by reducing misery index statistics in Pakistan through adoption of supply side economic policy as suggested by Tang and Lean (2009).

Government should pay proper attention to cultivate human capital by enhancing public spending on health and education and to introduce effective steps to enhance the institutional quality which may be helpful in reducing crimes as these bodies can use stick and carrot policy to control crimes. Moreover, institutions can channel human capital for productive purposes, encourage foreign direct investment, promote economic growth and reduce misery. Institutions can also increase the efficiency and effectiveness of the delivery of social services to the poor class of the society. As far as functioning of legal institutions is concerned there is a need to strengthen institutions so that they can design and implement proper rules and regulations for controlling crime in Pakistan. Government should pay attention to implement population control policies properly so that size of the population may be kept at that level which better matches with available resources. Furthermore, there is need to pay attention to increase the pace of economic growth which may provide ample opportunities to the people so that crime can be reduced in the country.

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