UNEMPLOYMENT, POVERTY, INFLATION AND CRIME NEXUS: COINTEGRATION AND CAUSALITY ANALYSIS OF PAKISTAN

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Abstract. This study is designed to investigate the relationship between crime and various economic indicators such as unemployment, poverty and inflation in Pakistan. The study covers the period for 1975-2007. The stationary properties of the time series data are examined by using Augmented Dickey-Fuller (ADF) test. Johansen Maximum Likelihood Cointegration and Granger Causality tests are applied to find out long-run relationship along with causality among the variables. The findings of the tests provide evidence of the existence of long-run cointegration relationship among crime, unemployment, poverty and inflation. The Granger causality has been tested through Toda-Yamamoto procedure. The causality results show that crime is Granger caused by unemployment, poverty and inflation in Pakistan.

I. INTRODUCTION

Crimes have always plagued every society in human history. The history of crime is as old as history of mankind. The first crime was committed by Cain, the first son of Adam and Eve, when he murdered his brother Abel out of jealousy.

Crime is a major source of insecurity and discomfort in every society. There is no doubt that crime inflicts enormous monetary and psychological

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costs on society. The act of criminality gives rise to the feeling of insecurity and fear to those who have not been a victim as well. This sense of panic of being victimized generates negative effects on well being.

Crime can be defined as a wrongdoing classified by the state or the parliament of the country or law of the land. Each country sets out series of acts (crime), which are prohibited, and punishes a criminal of these acts by a fine or imprisonment or both.

There is no universal and permanent definition of crime. It differs in different times in different regions. According to Curzen, "A crime as an act or omission of human conduct harmful to others which the state is bound to prevent. It renders the deviant person liable to punishment as a result of proceedings initiated by the state organs assigned to ascertain the nature, the extent and the legal consequences of that person's wrongness" (see Auolak, 1999).

The literature on Economics of Crime sprang from the seminal contribution by Becker (1968) and Ehrlich (1973). In 1968, Becker presented a paper which changed the way of thinking about criminal behaviour. He was the one who built first model of criminal choice stressing that "some individuals become criminals because of the financial and other rewards from crime compared to legal work, taking account of the likelihood of apprehension and conviction, and the severity of punishment."

The Becker's paper opened the door to a new field of empirical research whose main purpose was to verify and study the socioeconomic variables that affect crime. The economics of crime interacts with different and heterogeneous fields, *i.e.* (Sociology, Criminology, Psychology, Geography and Demography) and it is closely related to poverty, social exclusion, wage and income inequality, cultural and family background, level of education and other economic and socio-demographic factors that may affect an individual's propensity to commit crime such as age, gender and urbanization.

Economics of crime has become a new field of investigation, particularly due to the fact that there has been a rapid increase in criminal activities in various western and eastern countries of the world. There is a vast amount of literature available on the relationship between crime and their major determinants in countries like United States, United Kingdom, Germany and Italy. Some studies are also conducted which have analyzed the determinants of crime in Latin American countries such as Colombia and Argentina, *e.g.* Buohanno (2003).

No in-depth and systematic study of the impact of lawlessness on Pakistan's economy has been undertaken so far. Stray articles have appeared in newspapers and magazines highlighting the adverse impact of disturbances but the problem has not been examined in any coherent way from the standpoint of national economy as a whole. This study is an attempt to identify and examine the economic factors responsible for promoting crime in Pakistan. The main objective of the study is to analyze empirically the relationship between crime and major economic factors (unemployment, poverty and inflation) and to recommend policy measures to help check and prevent crime rate in Pakistan.

The remainder of the paper is organized as follows. In section II, relevant literature is reviewed. Section III presents crime scene in Pakistan. Methodology is discussed in section IV. The results of the study are elaborated in section V. Conclusions are presented in section VI and finally section VII presents proposed suggestions.

II. REVIEW OF PREVIOUS STUDIES

Many studies have been conducted on the relationship between crime and its determinants. The results of these studies show that these various factors are responsible for promoting crime in the world.

Fleisher (1966) studied the role of income on the decision to commit criminal acts by individuals. The author stated that the principal theoretical reason for believing that low income increases the tendency to commit crime is that the probable cost of getting caught is relatively low. It is because of the reason that low income individuals view their legitimate lifetime earning prospects dismally they may expect to lose relatively little earning potential by acquiring criminal records. They feel that not only legitimate earnings are 'low' but also the opportunity cost of time actually spent in delinquent activity, or in jail, is low.

Becker (1968) presented a model based on costs and benefits. His approach was formed from the usual analysis of the expected utility; that persons will commit crime or offence if they presume that their utility will be greater than if they used their time and resources in some other activity.

Ehrlich (1973) considers that unemployment has its effects on crime rate. He says that unemployment rate can be viewed as a complementary indicator of income opportunities available in the legal labour market. Therefore, when unemployment rate increases, the opportunities in the legal sector decrease leading individuals to involve in criminal activities.

Fajnzylber *et al.* (2002) using simple correlations, OLS regressions and dynamic Generalized Method of Moments (GMM) for panel data show that both income inequality and crime rate are positively related.

Lee (2002) examines the relationship between labour market conditions and various crime series in three Asia-Pacific countries, Australia, Japan and South Korea. Johansen maximum likelihood cointegration and Granger causality tests were applied to time series data to see the existence of long-run equilibrium or a causal link between unemployment and crime variables. The results of the study provide a strong support for a long-run equilibrium relationship between unemployment and various crime series.

Coomer Nicole (2003) undertook a study to examine the influence of macroeconomic factors on crime. He applied OLS regression to find out the results. In his analysis, he first included unemployment, poverty, prison population, high school and college education level and income disparities as independent variables and run the regression to get the relationship. He then dropped the insignificant variables and rerun the regression and found that unemployment, inflation and poverty influence crime positively.

Gumus (2004) uses large US city data to empirically investigate the determinants of crime in urban areas using OLS regression technique. The results indicate that income inequality, per capita income, and presence of black population are all important determinants of crime in urban areas. Unemployment rate and police expenditures have also important effect in the determination of crime.

Teles (2004) investigates the effects of macroeconomic policies on crime. He points out that monetary and fiscal policies have an impact on crime. His results show that fiscal policies affect crime through government spending and monetary policy affects crime through inflation.

III. CRIME SCENE IN PAKISTAN

PAKISTAN STATUS IN THE WORLD OF CRIME

To start with this section, we shall have a look at the crime picture in the world as well as in Pakistan. Table 1 provides the total number of crime of the world top countries along with other selected countries including Pakistan.

Table 1 shows that the United States, Germany and United Kingdom are the top three countries in absolute numbers. Pakistan's rank is 23rd amongst other countries whereas India is 10th. Daily average of crime in Pakistan is

1144 as against 64870 in USA, 17164 in Germany, 14166 in UK and 4834 in India.

TABLE 1
Total Crime by Country

Rank	Country	Total Crime	Rank	Country	Total Crime
1	United States	23677800	10	India	1764630
2	Germany	6264720	19	Finland	530270
3	United Kingdom	5170830	20	Denmark	504240
4	France	3771850	22	New Zealand	427230
5	South Africa	3422740	23	Pakistan	417846*
6	Russia	2952370	37	Greece	102783
7	Canada	2476520	40	Ireland	81274
8	Japan	2443470	50	Moldova	38267
9	Italy	2205780	–	Pakistan	538048**

*1999 Figure, **2007 Figure

Source: Seventh United Nations Survey of Crime Trends and Operations of Criminal Justice Systems (United Nations Office on Drugs and Crime, Centre for International Crime Prevention), Bureau of Police Research and Development, Ministry of Interior, Islamabad.

CRIME SCENARIO IN PAKISTAN

Crime Statistics of Pakistan shows that there is a rapid increase in the number of crime reported over time like other countries of the world. It may be because of high unemployment, rising poverty, increasing inflation and urbanization. Some other non-economic factors are also responsible for it. The impact of rising crime is not confined to the illiterate and poor class of society; even some wealthy, well-placed and educated persons are also involved in committing crime. They are in the race of accumulating wealth through illegal means. Furthermore, these people have sources to exploit loopholes in the legal system to get away with crime in Pakistan. Further-more, majority of the people who have meager resources at their disposal to meet their both ends are also involved in crime in the country. The crime statistics of Pakistan indicates that the country is not doing well in economic, social, cultural, technological, environmental, moral and spiritual fields.

Nowadays crimes have become more organized and some criminals have gained the patronage of powerful elites. The Government of Pakistan had taken steps to control crime in Pakistan in the past. For example, the surveys were conducted to identify parts of the country by city or areas

where the incidence of crime was relatively high along with their major causes. Various steps were taken in those areas/cities to check the crime but unfortunately because of corruption, poor implementation of policies and rising terrorist attacks the circumstances were quite disappointing. Furthermore, lack of justice and influence of powerful on judiciary also encouraged crime in the country.

The available crime statistics show that the total crime cases registered in 1947 at the time of Independence were 73,105, which doubled to 129,679 in 1971. Then there is rapid increase in crime rate particularly after 1980. The total reported crime during the decade from 1980 to 1990 almost doubled from 152,782 to 403,078 and the number of crime reached to 43804 in 2007. The annual growth rate of crime has generally been higher than that of population growth rate since 1951. These figures relate to the reported crime only. No reliable figures can be given about the unreported crime in the country. However, about 30-50% crimes are generally considered to be unreported in Pakistan.

Pakistan's population is currently growing at a rate of almost 2 percent per annum. The total population at the time of Independence was about 30 million and it is 158.17 million in 2007 (almost five times). Table 2 shows total population, total crime, their growth rates and crime committed per population of 100,000 for selected years from 1951 to 2007.

Table 2 shows that the number of crime per 100,000 population has gone up from 226 to 340 during the reference period. In 1971, the reported crime per hundred thousand population were estimated at 206 that rose to 323 in 1998. It shows an increase of 56.79 percent in crime. The reported crime includes murders, attempted murder, kidnapping for ransom, car lifting, dacoity, rap, robbery and theft etc. During the period from 1981 to 1986, growth in crime rate had been over 4 percent per annum, which outstripped the population growth of 3 percent. This was an era of martial law, Afghan war, flow of Afghan refugees in the country, narcotics trafficking, gun running, and kidnapping for ransom.

Crime population ratio given in the above-mentioned table reveals that in 1966, 180 offences were reported per 100,000 population. By the year 1991, it increased to 257 per 100,000 population, which shows an increase of 40%. The situation further worsened in 1998 when the reported offences increased to 323 per 100,000 persons.

However, the total number of crime has shown increasing trend, yet on the basis of crime per 100,000 population, it is less than 300 in the years

1998-2005 but in the year 2007 the reported offences increased to 340. Number of Crime per 100,000 population in Pakistan does not fully indicate the growth of the alarming increase in crime. The society, however, feels alarmed when the number of crime show increasing trend and hit the headlines in the press daily and the people start feeling concerned about their safety and security.

TABLE 2

Population and Crime Growth in Pakistan

Year	Total Population in Millions	Total No. of Crimes Reported	Crime Growth Rate (%)	Crime per thousand of Population
1951	33.82	76519		226
1958	38.12	81124	6.02	212
1961	42.97	79900	−1.51	185
1966	51.98	93633	17.19	180
1971	62.88	129679	38.50	206
1976	72.12	167032	28.80	228
1981	83.84	152782	−8.53	215
1986	97.67	220035	44.02	248
1991	112.61	403078	83.19	257
1998	133.61	431854	7.14	323
2000	139.76	388909	−9.94	278
2003	149.03	400680	3.03	267
2005	153.96	453264	13.12	294
2007	158.17	538048	18.71	340

Source: Pakistan Economic Survey (Various issues)

Bureau of Police Research and Development, Islamabad

Nadeem, Azhar Hassan (2002), *Pakistan*: *The Political Economy of Lawlessness*. Karachi: Oxford University Press.

Position of United States and United Kingdom is 8th and 6th in terms of world ranking on the basis of crime per 100,000 population while Dominica tops the list followed by New Zealand, Finland and Denmark. Contrary to

the general belief that Pakistan as a heaven for criminals, she is way behind at 57th position in the world. This situation could be partly attributed to a large number of unreported cases of crime, estimated at about 50% in the west, where most of the crime cases are reported/recorded in their criminal records. However, even if this under reporting is taken into account the number of crime cases per 100,000 population will just push up Pakistan's ranking by two or three positions only. India is, however, better off with average of 163 per 100,000 population as against 305 in Pakistan which is 87% higher than India.

CRIME SCENE IN PAKISTAN WITH TYPES

In Table 3, crimes reported in Pakistan by types from 1996-2007 are presented.

TABLE 3

Crimes Reported by Type

Year	Dacoity	Robbery	Burglary	Cattle Theft	Murder/ Attempted Murder	Kidnapping / Child Lifting	All Reported
1996	1188	6107	10526	5474	21499	7189	330493
1997	1428	7793	13803	7141	21744	7972	370350
1998	1533	7514	13771	6938	23326	7774	431854
1999	1316	6337	13586	6877	21374	7538	417846
2000	1297	7513	14433	6618	20130	7176	388909
2001	1372	7672	13057	5542	20961	6546	378301
2002	1631	8235	13318	5420	20341	6938	399568
2003	1821	8434	13049	6742	20908	8450	400680
2004	2338	11851	13647	7924	22397	9637	440578
2005	2395	12199	12067	11884	22494	9209	453264
2006	2895	14630	12872	13327	23777	10431	537866
2007	3260	16639	12067	9388	24396	10725	538048

Source:　Pakistan Statistical Yearbook 2008.

The total number of reported crime has gone up by about 63 percent during the period 1996-2007. A rapid growth is recorded in case of dacoity, robbery and cattle theft and the lowest one is in case of murder/attempted murder. The nature of crime committed indicates that the increase in crime committed was financially motivated.

IV. METHODOLOGY

COINTEGRATION

Applied econometrics technique tends to estimate long-run relationship among the variables which implicitly considers the constancy doctrine of the variables involved, implying that the mean and variance being constant are not dependent on time. But empirical research in most of the cases has shown that constancy doctrine is not satisfied by time series variables. Therefore, usual F and t test etc. based on estimated method considering constancy doctrine or in other words assume without verification that variables involved in the estimation are stationary give misleading results and hence these tests are not valid.

If the variables are non-stationary (showing trend with time), the co-efficient seems to be significant when they are not. This is known as spurious regression problem. The main indication of this problem is $R^2 > $ DW (Durbin Watson).

Cointegration analysis has been regarded as perhaps the most revolutionary development in econometrics since 1980's. In simple words, this analysis refers to a group of variables that drift together although individually they are non-stationary in the sense that they tend upward or downward over time. This common drifting of the variables makes the linear relationship among these variables exist over a long period of time.

Generally cointegration analysis is a technique used in the estimation of long-run equilibrium parameters in relationship with non-stationary variables. It is a new method for specifying estimation and testing dynamic models and, therefore, can be used for testing the validity of underlying economic theories.

GRANGER CAUSALITY THROUGH
TODA-YAMAMOTO PROCEDURE

The usual Granger causality test leads to spurious regression results, and the *F*-test is not valid unless the variables in levels are cointegrated. New developments in econometrics offer the error correction model (due to Engle and Granger, 1987) and the vector auto regression error-correction model (due to Johansen and Juselius, 1990) as alternatives for the testing of causality between economic time series. Toda and Yamamoto (1995) showed that these tests are cumbersome and sensitive to the values of the nuisance parameters in finite samples and therefore their results are unreliable.

A new method has been proposed by Toda and Yamamoto (1995) for causal inference based on augmented level VAR with integrated and co-integrated processes. The advantage of using this procedure is that it is not necessary to pretest the variables for the integration and cointegration properties and therefore, it avoids the possible pretest biases.

Toda and Yamamoto procedure uses a Modified Wald (MWALD) test for restrictions on the parameters of the VAR (k) model. This test has an asymptotic Chi-squared distribution with k degrees of freedom in the limit when a VAR $[k + d\,(max)]$ is estimated (where k is the lag order of VAR and d(max) is the maximal order of integration for the series in the system).

Two steps are involved in implementing the procedure. The first step includes determination of the lag length (k) and the maximum order of integration (d) of the variables in the system. Schwartz's Bayesian Information Criterion (SBC) and Hannan-Quinn (HQ) Information Criterion are used to determine the appropriate lag structure of the VAR. Given VAR (k) selected, and the order of integration d(max) is determined, a level VAR can then be estimated with a total of $p = [k + d\,(max)]$ lags. The second step is to apply standard Wald tests to the first k VAR coefficient matrix (but not all lagged coefficients) to make Granger causal inference.

Toda and Yamamoto (1995) augmented Granger causality test uses the Seemingly Unrelated Regression (SUR) technique through estimating a two equation system. Rambaldi and Doran (1996) showed that the Wald test improves efficiency when SUR models are used in the estimation. So, the model can be specified as follows:

$$Y_t = \alpha_1 + \sum_{i=1}^{k+d} \gamma_{1i} Y_{t-i} + \sum_{t-i}^{k+d} \gamma_{2i} X_{t-i} + \varepsilon_{yt} \tag{A}$$

$$X_t = \alpha_2 + \sum_{i=1}^{k+d} \delta_{1i} Y_{t-i} + \sum_{t-i}^{k+d} \delta_{2i} X_{t-i} + \varepsilon_{xt} \tag{B}$$

Where k = Optimal lag order; d = Maximal order of integration of the series in the system; and ε_{yt} and ε_{xt} are error terms that are assumed to be white noise.

Usual Wald tests are then applied to the first k coefficient matrices using the standard χ^2-statistics. The main hypothesis can be drawn as follows:

(*a*) X_t "Granger-causes" Y_t if $\gamma_{2i} \neq 0$ in equation (A)

(*b*) Y_t "Granger-causes" X_t if $\delta_{1i} \neq 0$ in equation (B)

In order to determine whether there exists a casual relationship between crime, poverty, unemployment, and inflation, the study uses Granger causality test introduced by Granger which has been widely employed to examine the direction of causality among time series variables. However, before the study can proceed to use the Granger causality test, it is needed to check the stationary properties of the variables under investigation.

Presence of cointegration among variables will suggest the evidence of Granger causality which implies that there must be at lest one instance of Granger causality either unidirectional or bidirectional. If there is a case where variables are not stationary, the usual asymptotic distributions of the test statistic in the Granger test may not be valid. Therefore, it is pre-requisite to ensure stationarity of the variables before proceeding.

In order to check the time series properties of the variables, the study uses Augmented Dickey Fuller (ADF) test. The study also uses the Todo-Yamamoto (1995) modification version of the Granger causality test, which has an advantage of handling non-stationary variables.

The concept of the Granger causality test is based on the notion that events in the past cannot be influenced by the events today or in future. Therefore, if X event occurs before event Y, then only event X can cause, event Y. When X causes Y and Y does not cause X, this is called as unidirectional causality. When variable X and Y are jointly determined it is known as feedback causality.

V. EMPIRICAL FINDINGS

We first examine the time series properties of the data using Augmented Dickey Fuller (ADF) test that is based on inclusion of both intercept and linear time trend and it is also performed without the trend term. AIC and SBC are used for the selection of optimal lag length in unit root test for all the variables. The data set consists of Pakistani observations on total crimes, poverty,[1] unemployment rate, and inflation. A crime index is developed for total crimes.[2]

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[1]The data on poverty is taken from Jamal (2004) from the study "Does inequality matter for poverty reduction? Evidence from Pakistan's poverty trends" in which Gini coefficient is estimated for Pakistan.

[2]The data set is yearly and covers the period 1975-2007. The data series are obtained from various sources such as Pakistan Economic Survey (various issues), Pakistan Statistical Yearbook, United Nations International Crime Victimization Survey, Bureau of Police Research and Development, Punjab Development Statistics, Census of Population, etc.

The test can be performed by using the following three kinds of regressions.

1. Without intercept and deterministic time trend
2. With intercept
3. With both intercept and deterministic time trend

$$\Delta Y_t = \beta Y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta Y_{t-j} + \varepsilon_{1t}$$ (Without intercept and deterministic time trend); $$\Delta Y_t = \alpha_0 + \beta Y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta Y_{t-j} + \varepsilon_{2t}$$ (With inclusion of an intercept term); and $$\Delta Y_t = \alpha_0 + \alpha_1 t + \beta Y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta Y_{t-j} + \varepsilon_{3t}$$ (With both intercept and deterministic time trend).

where

$\Delta Y_t = Y_t - Y_{t-1}$

p = Number of lags in the dependent variable.

ε_{1t}, ε_{2t} and ε_{3t} are stochastic error terms.

The ADF test uses the following hypothesis:

H_0: $\beta = 0$; (Y_t is Non-Stationary)

H_a: $\beta < 0$; (Y_t is Stationary)

The variable is said be stationary when we reject the null hypothesis in favour of alternate hypothesis if the value of test statistic is less than the critical value. If we do not reject the null hypothesis it implies that time series is non stationary at the level which requires first or higher order differencing to make it stationary.

The results of the ADF test are reported in the table given below. First the property of the data is checked at level and then first difference is taken to make it stationary. The results of ADF are summarized in Table 4.

The optimal lag length is important to identify the true dynamics of the model. To determine optimal lag length of VAR system, the LR, FPE, AIC, SBC, and HQ lag selection criteria are used. Therefore, the study decides to choose 3 lags in VAR. The results of selecting optimal lag length of VAR are reported in Table 5.

Table 4

ADF TEST

Unit Root Test for Crime and Economic Determinants
Using Augmented Dickey Fuller Test

Variable	Only Intercept	Trend and Intercept
Crime		
Level	–2.04038 (0.2690)	–2.987404 (0.1520)
1st Difference	–5.291820* (0.0002)	–5.194990* (0.0012)
Unemployment		
Level	–1.21765 (0.2337)	–3.240079 (0.0960)
1st Difference	–5.487514* (0.0001)	–5.377704* (0.0008)
Poverty		
Level	–2.133685 (0.2337)	–2.236359 (0.4531)
1st Difference	–5.157977* (0.0003)	–5.624418* (0.0005)
Inflation		
Level	–2.583201 (0.1078)	–2.417370 (0.3636)
1st Difference	–3.098851* (0.0391)	–7.723243* (0.00000

Note: *indicates variable is integrated of order 1 at 5% level of significance.

Values in parentheses are p-values

TABLE 5

Lags under Different Criteria

Lag	LR	FPE	AIC	SC	HQ
0	NA	127168.2	23.10465	23.29497	23.16283
1	125.1249	1756.836	18.80730	19.75887*	19.09820
2	25.50068	1557.739	18.60801	20.32085	19.13164
3	26.43643*	1037.671*	17.98844*	20.46253	18.74480*

Note: *indicates lag order selected by the criterion

Johansen cointegration test results are presented in Table 6. The table depicts the results of cointegration rank test suggesting the existence of at most three cointegrating vectors in the system at 0.05 level. The results lead to conclude the existence of cointegration relationship between crime and poverty, unemployment, and inflation in Pakistan.

TABLE 6

Johansen Cointegration Test Results

Number of cointegrating vectors	Trace			λ-max		
	Statistic	C (5%)	Prob.**	Statistic	C (5%)	Prob.**
$r = 0$	91.19400*	47.85613	0.0000	39.83823*	27.58434	0.0008
$r \leq 1$	51.35577*	29.79707	0.0001	31.69321*	21.13162	0.0012
$r \leq 2$	19.66255*	15.49471	0.0111	12.97687	14.26460	0.0791
$r \leq 3$	6.685682*	3.841466	0.0097	6.685682*	3.841466	0.0097

*denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug – Micheilis (1999) p-values

GRANGER CAUSALITY BASED ON TODA-YAMAMOTO

The results of the Granger causality test based on Toda-Yamamoto procedure are reported in Table 7. The values in the parentheses are probability values whereas rests of the estimates are F-statistics.

TABLE 7

Granger causality test results between CI_t, Un_t, Po_t and INt
Based on the Toda-Yamamoto Procedure

Dependent Variable	Modified Wald-Statistics			
	CI_t	UN_t	PO_t	IN_t
CI_t	–	9.50402 (0.0497)	16.2765 (0.0027)	15.2185 (0.0043)
UN_t	1.04157 (0.9034)	–	6.9986 (0.1360)	4.06732 (0.3970)
PO_t	4.6610 (0.3239)	10.45804 (0.0334)	–	8.4672 (0.0759)
IN_t	4.9371 (0.2938)	7.2238 (0.1245)	5.7151 (0.2215)	–

Note: All estimates are asymptotic Granger F-statistics. Values in parentheses are p-values.

The results indicate that there is unidirectional causality that runs from unemployment, poverty and inflation to crime. It is also observed that both unemployment and inflation cause poverty in Pakistan. The bottom line of the discussion is that unemployment, poverty and inflation promote crimes in Pakistan. In other words, crime is Granger caused by unemployment, poverty and inflation in Pakistan.

VI. CONCLUSIONS

The main objective of the study is to identify and examine the economic factors such as inflation, poverty and unemployment responsible for promoting crimes in Pakistan. The results of the study reveal that the above-mentioned economic factors have relationship with crimes. The following conclusions have been drawn from this study:

1. The results of the data analysis reveal that unemployment in Pakistan Granger causes crime. The reason is that unemployment rate in a country is a complementary indicator of income opportunities in the legal labour market. Therefore, when, unemployment rate increases the opportunities for earning income decreases which instigate the individuals to commit crime. The costs of committing crime go down for unemployed workers. The results of causality support this proposition that unemployment causes crime.

2. The results show that poverty also Granger causes crime. The poor have limited income and resources to satisfy their desires and wants. In Pakistan the poverty statistics show dismal picture besides increasing income inequality. The low income means low saving potential which results in low standard of living. The low income in relation to increase prices (inflation) has crime instigating effect by reducing individual's moral threshold. Therefore, it can be concluded that people in poverty are induced to commit crime. The results of Granger causality through Toda-Yamamoto procedure affirm that poverty causes crime.

3. Price stability or a reasonable price level is one of the major objectives before policy makers for bringing macroeconomic stability in the country. In our case, inflation is also Granger causing crime and there is an evidence of unidirectional causality from inflation to crime. Increased prices result in decreasing real income of the individuals which reduces the purchasing power of the individuals belonging to low income group. This situation forces

them to boost their income for maintaining their existing living standards by legitimate or illegitimate means including criminal activities. The results of causality test verify out hypothesis that inflation Granger causes crime.

VII. RECOMMENDATIONS

In the light of the results of this study, the following recommendations are suggested to prevent crimes and reduce crime rate in Pakistan. These recommendations may help the government in formulation of policies that can be appropriate in curtailing the crime rate in Pakistan.

1. Economic growth with social and economic justice should be a key objective of the planning strategy. Entire reliance should not be placed on trickle down effect of economic growth because by itself this process is quite slow in reducing poverty unless deliberate policies are adopted which directly affect the poor.

2. All the major economic determinants of crime – unemployment, inequalities, GDP growth etc. are needed to be adequately addressed by the policy makers to check the crime rate in the country.

3. In order to reduce the crime rate it is important that economic growth has to be favourable for poor class of the society. It should follow a path that directs resources to those sectors where majority of the poor exist like agriculture sector and the areas where they live (comparatively less developed areas).

4. Capital base of the banks engaged in providing loans to the poor such as Khushali Bank needs to be substantially increased every year. Early justice through fast-track courts, where the powerful do not influence judiciary, can bring the desired change. Furthermore, there is a need to raise the overall standard of governance in Pakistan with a special emphasis on reducing crime.

REFERENCES

Allen, Ralph (1996), Socioeconomic conditions and property crime: A comprehensive review and test of the professional literature. *American Journal of Economics and Sociology*, Volume 55, pp. 293-308.

Auolak, Majeed Ahmed (1999), *Prison Administration in Pakistan*. Lahore: S and S Publishers.

Becker, Gary S. (1968), Crime and punishment: An economic approach. *Journal of Political Economy*, Volume 76, pp. 169-217.

Becker, Gary S. (1993), Nobel lecture: The economic way of looking at behaviour. *The Journal of Political Economy*, Volume 101(3), pp. 385-409.

Becker, Gary S. and Kevin M. Murphy (1988), A theory of rational addiction. *The Journal of Political Economy*, Volume 96(4), pp. 675-700.

Becker, Gary S. and George J. Stigler (1977), De Gustibus Non Est Disputandum. *The American Economic Review*, Volume 67(2), pp. 76-90.

Buohanno, Paolo (2003), The Socioeconomic Determinants of Crime: A Review of the Literature. *Universita dgli Studi di Milano-Bicocca.*

Cerro, Ana M. and Osvaldo Meloni (2000), Determinants of the crime rate in Argentina during the 1990s. *Estudios de Economia*, Volume 27(2), pp. 297-311.

Coomer, Nicole (2003), America's underclass and crime: The influence of macroeconomic factors. *Issues in Political Economy*, Volume 12.

Crow, Lain, Paul Richardson, Carol Riddington and Frances Simon (1989), *Unemployment, Crime and Offenders*. New York: Routledge Publications.

Cullen, Julie Berry and Steven D. Levitt (1999), Crime, urban flight, and the consequences for cities. *The Review of Economics and Statistics*, Volume 81(2), pp. 159-169.

Doyle, Joanne M., Ehsan Ahmed and Robert N. Horn (1999), The effects of labour markets and income inequality on crime: Evidence from panel data. *Southern Economic Journal*, Volume 65(4), pp. 717-738.

Edward, L. Glaeser, Bruce Sacerdotal and Jose A. Scheinkman (1996), Crime and social interactions. *The Quarterly Journal of Economics*, Volume 111(2), pp. 507-548.

Ehrlich, Isaac (1973), Participation in illegitimate activities: A theoretical and empirical investigation. *The Journal of Political Economy*, Volume 81(3), pp. 307-322.

Ehrlich, Isaac (1996), Crime, punishment and market for offences. *The Journal of Economic Perspectives*, Volume 10(1), pp. 43-67.

Ekblom, Paul and Ken Pease (1995), Evaluating crime prevention. *Crime and Justice*, Volume 19, pp. 585-662.

Fajnzylber, Pablo, Daniel Lederman and Norman Loayza (2000), Determinants of crime rates in Latin America and the world: An empirical assessment. *World Bank Latin American and Caribbean Studies*.

Fleisher, Belton M. (1966), The effect of income on delinquency. *The American Economic Review*, Volume 55(1/2), pp. 118-137.

Maddala, G. S. (1992), *Introduction to Econometrics*, 2nd edition. New York: Macmillan Publishing Company.

Government of Pakistan, *Pakistan Economic Survey* (various issues). Islamabad: Finance Division.

Grogger, Jeffrey (1995), The effects of arrests on the employment and earnings of young men. *The Quarterly Journal of Economics*, Volume 110(1), pp. 51-71.

Grogger, Jeffrey (1998), Market wages and youth crime. *Journal of Labour Economics*, Volume 16(4), pp. 756-791.

Gumus, Erdal (2004), Crime in urban areas: An empirical investigation. *Akdeniz I.I. B.F. Dergisi*, Volume 7, pp. 98-109.

Jamal, Haroon (2004), *Does Inequality Matter for Poverty Reduction? Evidence from Pakistan's Poverty Trends*. Social Policy and Development Centre, Research Report Number 58. Social Policy and Development Centre, Karachi.

John, J. Dilulio (1996), Help wanted: Economists, crime and public policy. *The Journal of Economic Perspectives*, Volume 10(1), pp. 3-24.

Johansen, S. and Katarina Juselius (1990), Maximum likelihood estimation and inference on cointegration – With applications to the demand for

money. *Oxford Bulletin of Economics and Statistics*, Volume 52, No. 2, pp. 169-210.

Kardar, Shahid (2006), *Reflections on Pakistan's Economy*. Lahore: Heritage Publications.

Kelly, M. (2000), Inequality and crime. *The Review of Economics and Statistics*, Volume 82(4), pp. 530-539.

Kemal, A. R. and Rashid Amjad (1997), Macroeconomic policies and their impact on poverty alleviation in Pakistan. *The Pakistan Development Review*, Volume 31(1), pp. 39-68.

Landes, William M. and Gary S. Becker (1974), *Essays in the Economics of Crime and Punishment*. New York: National Bureau of Economic Research.

Lee, Y. Daniel (2003), *Income Inequality and Crime*: *Cointegration Analysis and Causality Tests*. Shippensburg University.

Levitt, Steven D. (1998), Juvenile crime and punishment. *The Journal of Political Economy*, Volume 106(6), pp. 1156-1185.

Machin, S. and C. Meghir (2000), Crime and economic incentives. *IFS Working Paper W00/17*, Institute for Fiscal Studies.

Mathur, K. Vijay (1978), Economics of crime: An investigation of deterrent hypothesis for urban areas. *The Review of Economics and Statistics*, Volume 60(3), pp. 45-466.

Myers, L. Samuel (1983), Estimating the economic model of crime: Employment versus punishment. *The Quarterly Journal of Economics*, Volume 98(1), pp. 157-166.

Nadeem, Azhar Hassan (2002), *Pakistan*: *The Political Economy of Lawlessness*. Karachi: Oxford University Press.

Nilsson, Anna (2004), *Income Inequality and Crime*: *The Case of Sweden*. Stockholm University.

Pindyck and Rubinfeld (1991), *Econometric Models and Economic Forecast*. New York: McGraw-Hill.

Robert, F. Engle and C. W. J. Granger (1987), Cointegration and error correction: Representation, estimation and testing. *Econometrica*, Volume 55(2), pp. 251-276.

Roberts, Julian V. (1992), Public opinion, crime and criminal justice. *Crime and Justice*, Volume16, pp. 99-180.

Sah, Raaj K. (1991), Social osmosis and patterns of crime. *The Journal of Political Economy*, Volume 99(6), pp. 1272-1295.

Sherman, Lawrence W. (1992), Attacking crime: Police and crime control. *Crime and Justice*, Volume 15, pp. 159-230.

Stack, Steven (1984), Income inequality and property crime. *Criminology*, Volume 22, pp. 229-259.

State Bank of Pakistan (2005), *The Handbook of Statistics on Pakistan Economy 2005*.

Teles, Vladimir K. (2004), The effects of macroeconomic policies on crime. *Economics Bulletin*, Volume 11(1), pp. 1-9.

Tonry, Michael and David P. Farrington (1995), Strategic approaches to crime prevention. *Crime and Justice*, Volume19, pp. 1-20.

Witte, Ann Dryden (1980), Estimating the economic model of crime with individual data. *The Quarterly Journal of Economics*, Volume 94(1), pp. 57-84.

Witte, Ann Dryden and Robert Witt (2001), Crime causation: Economic theories. *Encyclopedia of Crime and Justice*.

World Bank (1998/99), *World Development Report*.

Zaidi, S. Akbar (2005), *Issues in Pakistan's Economy*. Karachi: Oxford University Press.