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Relationship between Economic Development and Crime rate in India

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Abstract:
This paper analyses the relationship between economic development and crime rate in India. Crime has a major negative impact on society both directly and indirectly. Although a plethora of literature emphasises how current economic conditions lead to crime, it is not impossible for crime and economic growth to be correlated in the opposite direction. The case study was carried out in India using annual time series data spanning from 1981 to 2020. The outcome of the Johnson Co-integration test suggests that the GDP and the number of crimes in India have a long-term equilibrium relationship. The Vector Error Correction test states that there is long-term unidirectional causality between GDP and the number of crimes.

Keywords: *Crime, GDP, Co-integration test, Causality, IndiaI*

1. Introduction

Generally, most crimes are mainly caused by economic factors. Economic factors such as unemployment, poverty, economic inequality, regional inequity, level of education etc. If people's necessities are not satisfied, there is a rise in crimes such as robbery, kidnapping, burglary, fraud, and theft. In a nation having economic growth, the income of the people rises, and the rise in income also improves the citizens' standard of living. With an increase in income, the necessities of the people are also satisfied. Hence, crime should decline in such a nation. Yet, if the benefits of economic development only reach the upper class and not the lower class, then income inequality will expand. As a result, crime in that nation increases rather than decreases with economic development.

India is a developing country. India's economy is getting better and better every day. Based on how fast India's economy is growing, it's safe to say that its GDP will soon reach 5 trillion dollars. India is one of the top five economies in the world right now. In the last few decades, as the economy has grown, so has the number of social and economic crimes. Which is really scary. This article seeks to investigate the link between India's economic development and crime rate. Previously, several researchers have published articles on this subject. In which an effort was made to investigate the impact of economic and social elements on crime, the following is stated:

2. Literature review

(Hazra & Cui, 2018)This article examines the relationship between crime, inflation, unemployment, and India's gross domestic product. The Johansen co-integration test validates the co-integration relationship between variables. The Toda–Yamamoto test suggests unemployment, which might have a significant effect on crime in India. Regrettably, they do not provide evidence of the relationship between crime, unemployment, and GDP.

(Mousumi Dutta and Zakir Husain, 2009) This article looks at how much the size of the police force, the number of arrests, the number of charge sheets, the number of convictions, and how quickly cases are

settled affect crime rates in India. It also looks at how much economic growth, poverty, urbanization, and education affect crime rates. The aforementioned variables were gathered at the state level from 1999 to 2005. The SURE model of Zellner is utilized to estimate the model. This is further expanded by incorporating endogeneity. Both deterrent and socioeconomic variables are significant in determining crime rates, as shown by the findings. Yet, some of their impacts vary from those seen in research in developed countries.

(Gillani & Gill, 2023) This research aims to determine how economic issues such as unemployment, poverty, and inflation influence crime in Pakistan. The research spans the years 1975 to 2007. Using the Augmented Dickey-Fuller (ADF) test, Johansen Maximum Likelihood co-integration and Granger causality tests are used to determine the long-term connection and causality between the variables. The test results indicate the presence of a long-term co-integration link between crime, unemployment, poverty, and inflation. The Granger causality has been examined using the Toda-Yamamoto method. The causation findings indicate that unemployment, poverty, and inflation in Pakistan are the causes of crime there.

3. Methodology

This analysis uses annual data from 1981 to 2020. All of the data was obtained from the Handbook of India, issued by the Reserve Bank of India, and the National Crime Bureau reports. In this study, these variables and their definitions are gross domestic product (GDP) and number of crimes (NC).

The data used to determine the link of causation between gross domestic product (GDP) and crime rate (NC). Before analysing the causal relationship between gross domestic product (GDP) and the number of crimes (NC), the data is converted into natural logarithms, and the possibility of unit roots is examined. Each series' stationarity is investigated through the Augmented Dickey-Fuller unit root test. The number of lag differences included is determined by the Schwarz and Akaike information criteria. Proceed with the VAR lag order selection criteria to determine the optimal latency length for the VAR time series model in order to conduct the Granger Causality test on all series. The Johansen co-integration test is also used for co-integration testing.

The fundamental empirical investigation serves two functions. The first objective is to investigate the long-run relationship between gross domestic product (GDP) and number of crimes (NC), while the second objective is to investigate the short-run dynamic causal relationship between GDP and NC. The fundamental testing procedure consists of three stages. The first stage is to affirm the stationarity of each variable by determining whether the variables contain a unit root. Utilizing the Augmented Dickey–Fuller (ADF) tests, this is achieved. In the second stage, we examine whether the variables are co-integrated over time. This is accomplished by utilizing the Johansen co-integration test. The final step is to determine whether all variables are integrated in the same order and are co-integrated. At this point, the Engle and Granger (1987) vector error correction model (VECM) method can compute short- and long-run causality tests.

In this study, annual data is used from 1981 to 2020. All the data were collected from Handbook of India published by reserve bank of India and National Crime bureau reports. Variables used in this study and the definitions are Gross Domestic Product (GDP) and number of crime (NC).

The data analyzed to determine the causality between Gross Domestic Product (GDP) and number of crime (NC). Before analyzing the causal relationship between Gross Domestic Product (GDP) andnumber of crime (NC), data has been transformed in to natural logarithms, and then possible existence of unit roots in the data is examined. The stationarity of each series is investigated by employing Augmented Dickey-Fuller unit root test. The number of lagged differences included is determined by the Schwarz Information Criterion and Akaike Information criteria. Further proceed with the VAR lag order

selection criteria to choose the best lag length for the VAR time series model to examine the Granger Causality test for all the series is performed. Johansen co-integration test is also applied to test for co-integration.

The basic empirical investigation has two purposes. The first one is to examine the long-run relationship between Gross Domestic Product (GDP) and number of crime (NC)while the second is to examine the short-run dynamic causal relationship between Gross Domestic Product (GDP) number of crime (NC). The basic testing procedure requires three steps. The first step is to test whether the variables contain a unit root to confirm the stationarity of each variable. This is done by using the Augmented Dickey–Fuller tests (ADF). In the second step we test for the existence of a long-run co-integrating relationship between the variables. This is done by the use of the Johansen co-integration test. Finally, the last step, if all variables are integrated of same order and co-integrated then short run and long run causality test can be computed using the vector error correction model (VECM) method suggested by Engle and Granger (1987).

4. Results

4.1 Test of Stationarity

The order of integration is one of the most important things to know about a time series variable. So, to figure out the order of merging of the series, we first do unit root tests in levels and first differences. We use a standard test called the Augmented Dickey-Fuller (ADF) test to check the order of integration.

Table: 1 Unit Root Test

Variable	At Level		At First Difference		Conclusion
	ADF	Prob.	ADF	Prob.	
Economic Development (GDP)	2.26388	0.9999	-7.5807	0.0000	I (1)
Number of Crime	-2.11623	0.2396	-4.0791	0.0029	I (1)

From the above table, it is clear that the estimated ADF statistics for level variables are less than the critical values. This means that the variables are not stationary at a level. Table 1 also shows that all of the variables are first-difference stationary based on the ADF data for them.

4.2 Lag Order Selection Criteria

We used the LR test statistic, the final forecast error, the Akaike information criterion, the Schwarz information criterion, and the Hannan-Quinn information criterion to find the best lag length for the co-integration study. All of the factors point to a leg length of 1 as being the best.

Table: 2 Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	128.4107	NA	3.69e-06	-6.833011	-6.745935	-6.802313
1	139.5628	20.49576*	2.51e-06*	-7.219612*	-6.958382*	-7.127516*
2	140.0365	0.819292	3.05e-06	-7.028998	-6.593615	-6.875505
3	140.7487	1.155042	3.66e-06	-6.851284	-6.241747	-6.636393

4.3 Johnson Juselius Co-Integration Test

Table: 3 Johnson Juselius Co-Integration Test

Johansen Test for Co-integration (Trace Test)				
Hypothesized No. of CE(s)	**Trace Statistic**	**0.05 Critical Value**	**Prob.**	**Conclusion**
None	18.73160	15.49471	0.0157	One Co integrating Relationship
At most 1	7.084073	3.841466	0.0078	
Johansen Test for Co-integration (Maximum Eigen value Test)				

Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	Prob.	Conclusion
None	11.64752	14.26460	0.1246	One Co integrating Relationship
At most 1	7.084073	3.841466	0.0078	

The results of the co-integration test are shown in Table3. For co-integration, there are two tests, the Trace test and the Maximum Eigen value test. At 5% levels, it is shown that the Trace-Statistic value is higher than the critical values. So, we reject the hypothesis that the factors don't have a co-integrated equation. So, we can say that the factors are part of at most one co-integrated equation. The same thing can be said about the results of the Maximum Eigen value test data. Lastly, we can say that the Gross Domestic Product (GDP) and number of crime (NC) have a long-term link.

4.5 Granger Causality Test Based on VECM:

Table 4: Long run Causality Test Based on VECM:

Causality	ECM_{t-1}	T-Statistic	Prob.	Result
Long run causality from Economic Development (GDP) to Number of Crime	-1.2249	-3.4196	0.0016	**Uni Directional Causality**
Long run causality from Number of Crime to Economic Development (GDP)	-0.3039	1.3893	0.1738	

The VECM long run causality result presented in Table 4 reveals the causal relationship between from Economic Development (GDP) to Number of Crime. The result showed that the error correction term for co-integrating equation with Economic Growth as a dependent variable is negative but not significant at five percent, implying that there is no long run relationship existing from Number of Crime to Economic Growth. The error correction term for co-integrating equation with Number of Crime as a dependent variable is negative and significant implying that there is long run relationship existing from Economic Growth to Agriculture Production in long run. Economic Development (GDP) to Number of Crime in long run.

5. Conclusion

In this paper, we have examined the relationship Economic Development (GDP) to Number of Crime in India during the period of 1981 to 2020. Vector Error Correction Method and Co-integration techniques are used for analysing the relationship between Economic Development (GDP) to Number of Crime in this study. The Johnson Co-integration test result indicates that there is long-run equilibrium relationship between Economic Development (GDP) to Number of Crime in India. The Vector Error Correction test reveals that there is Uni-directional causality running from Economic Development (GDP) to Number of Crime in the long run. It means Economic Development (GDP) leads to Number of Crime but Number of Crime does not lead to Economic Development (GDP) in long run.

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