Does crime depend on the 'state' of economic misery?

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Abstract

This paper examines the impact of economic misery on criminal activity the small island state, Barbados, using Markov-switching models. No evidence of a contemporaneous relationship between economic misery and crime was uncovered. On the other hand, Property and Theft of Motor crime respond to the state of misery with a lag of one period, supporting the criminal motivation effect. Economic misery is in the same regime as Property crime 50 percent of the time, and with Theft from Motor crime almost 60 percent of the time. There is a procyclical contemporaneous relationship between inflation and Property crime, lasting up to two periods. Unemployment's impact on Theft of Motor crime manifests after three periods, and supports the criminal opportunity hypothesis. Finally, Fraud-related crime and unemployment are concordant. Typical demand side policies to reduce the level of misery may not have the desired effect on crime, as reducing the unemployment rate or inflation rate respectively, could lead to an increase in the rate of crime, via the Phillips curve relationship. The most promising course of action may be supply side policies, designed to improve the long-run performance of the economy.

Key words: misery, Markov-switching, small island state, Barbados

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1. Introduction

Crime has historically been viewed as a major socio-economic issue. Socially, victims of crime can experience increased levels of distress and fear, while escalating crime levels in society may lead to a more fearful and overly cautious population. On the other side of the coin, offenders who are caught and reprimanded face exile from society during incarceration, and typically find it difficult to successfully re-enter society upon completion of their punishment. In terms of the economic impact, policymakers direct precious and oftentimes scarce resources away from productive sectors in order to increase protection for citizens and further combat criminal activity. These include purchases of weapons and equipment for law enforcers, while time is also devoted to efforts at preventing and solving crimes. In addition, time spent by criminals, both in the act of crime and in prison, can be viewed as wasted resources. Against this backdrop, it is not surprising that policymakers and academics have a keen interest in understanding the determinants of crime. This interest has generated a proliferation of work conceptualising and testing criminological theories, including the impact of economic welfare on crime.

It is generally understood that during periods of economic hardship, some persons turn to crime to compensate for income deficiencies. Not only does society expect criminal activity to be more prevalent during economic hardship, they also expect criminals to be more willing to take advantage of other's economic misery. In fact the NSW Bureau of Crime Statistics and Research (2012) conclude that factors affecting the economic well-being of society have a greater impact on crime levels than measures that influence the risk of arrest or the severity of punishment. However, there some evidence to date reject this hypothesis. Some authors find that crime rates and economic indicators either diverge (Uggen, 2012) or no relationship exists (Young, 1993).

The "Great Recession" has renewed the debate about whether a nexus exists between economic conditions and crime. After five years of global economic crisis, labour markets worldwide continue to be severely affected by low economic growth rates. By the end of 2012, 197 million people were jobless while another 39 million had given up on finding employment during the year (ILO, 2013). Policymakers and society alike have become increasingly concerned about the potential incentive unemployed persons have to engage in criminal activity for personal gain. However, a key question is, should they be concerned? One of the benefits of the recession was reduced inflation, caused by lower demand. Devine et al (1988) link inflation to increases in property crime. They posit that since inflation reduces the 'real income' of workers, a concurrent rise in the demand for illegal goods often accompanies high inflation periods. Hence, it is possible that the impact of rising unemployment could have been mitigated by lower rates of inflation

This paper seeks to test this hypothesis. We investigate the impact of economic conditions on crime using Okun's misery index. This index takes into account not only the rates of unemployment, but also the level of inflation within and is a practical indicator of economic conditions. The authors focus on the case on Barbados – a small island developing state. In evaluating the literature, most of the extant theoretical and empirical work is based on larger economies. But, are these findings applicable to small island states? By focusing on Barbados, the paper provides some insight into the relationship between economic conditions and economic misery in developing microstates, a niche which has been largely ignored in the literature.

Another appeal to studying the case of Barbados is that the island among the few countries that is highly sensitive to increases in crime Barbados depends heavily on tourism for income and economic growth (Jackman, 2012; Lorde et al., 2011; Worell et. al., 2011). Any increase in the risk of being affected by criminal activity will reduce the probability of a tourist choosing Barbados as a vacation destination. In fact, Lorde and Jackman (2013) estimate that a 1% increase in the crime rate results in a total economic loss of about US$150,000 or 0.04 percent of GDP while noting that in practice the magnitude is likely to be much greater. For many years, the tourism industry has been somewhat sheltered from inordinate criminal activity by a sense of social responsibility to the upkeep of the nation's main productive industry. Violation of this social contract could cause not only decisive damage to the tourism industry, but also the disruption of one of the world's more peaceful luxury vacation destinations.

The reliance of the Barbadian economy on tourism and of tourism on a crime-free environment creates a potentially harmful cycle of misery; a challenging economic environment may cause crime rates to increase, further harming economic well-being and triggering spiralling levels of crime. This harsh possibility is pertinent to the perilous situation in which Barbados finds itself five years after the global economic crisis began to negatively impact its main income-generating industry. The complexities of such a cycle are particularly critical for an industry that has performed well below its best in the past couple years (ECLAC, 2013). The imposition of further pressure on the Barbadian and global economic environments make this research a very timely practical guide for policymakers.

2. Review of the Related Literature

Most studies analysing economic conditions as a causal factor in explaining criminal activities stem from the seminal works of Becker (1968) and Ehrlich (1973). Embracing the theories of rational behaviour, Becker postulated that individuals weigh the benefits and costs of crime to determine whether it is, in fact, reasonable to engage in criminal activity. In this model, a criminal act is preferred and conducted if the total payoff is above that of legal alternatives. Ehrlich extended the work of Becker, focusing on the opportunity cost of time spent in legal and illegal job activities. In this model, the individual is free to combine a number of illegitimate and legitimate activities, or switch occasionally from one to another at any point in his/her life. Ultimately, individuals choose to maximize their utility by the optimal allocation of time and other resources to competing legal and illegal activities. Moreover, opportunities available in legitimate and illegitimate markets can help to determine the extent of participation in criminal activity.

The Becker-Ehrlich type models hint that there should be a positive relationship between unemployment and criminal activity, dubbed the motivation effect. Specifically, higher unemployment reduces the probability of legal employment and expected income, thus making criminal activity more attractive. While a positive relationship between unemployment and criminal activities is intuitively appealing, the logic does have its detractors. For instance, Cantor and Land (1985) develop a theoretical model demonstrating that unemployment can have two opposing effects on crime. In addition to the positive relation implied by the Becker-Ehrlich type models, there is also an opportunity effect resulting in a negative correlation between unemployment and crime. Cantor and Land opine that when more people are unemployed, there is less expenditure on physical property and there are more people at home to prevent traditional property crimes. In this case, the observed relation between crime and unemployment depends on which effect dominates.

In line with the theoretical literature, the accumulated body of empirical work can be best described as mixed: some studies provide evidence that a rise in unemployment is associated with a higher crime rate (Altindag, 2012; Buonanno and Montolio, 2008; Elliot and Ellinworth, 1998; Papps and Wikelman, 2000; Raphael and Winter-Ebmer, 2001 Tang, 2009); there is evidence of Cantor and Land's negative opportunity effect (Melick, 2003); and others find no statistically significant relation (Elliot and Ellingworth, 1996; Young, 1993). Further, different types of crime have varying relationships with unemployment.

These inconsistencies in the empirical literature often raise questions about the use of unemployment as the main indicator of the effect of financial distress on crime. Indeed, modern macroeconomics defines welfare as a function of both inflation and unemployment (Di Tella et al., 2001). Hence, unemployment alone may not provide a sufficient indication of financial distress; one might also consider the impact of inflation. There is some work to suggest that inflation impacts on crime. For instance, Devine et al. (1988), argue that inflation, by lowering the real income of low-skilled labour, rewards criminal activity and increases the profits of the illegal goods market. Second, inflation causes a loss in social control by the destruction of public confidence in the existing institutional arrangements. Third, it diminishes the economy's power to maintain adequate levels of deterrence against criminal activity. Teles' (2004) theoretical framework supports the idea that inflation has a significant effect on the optimal level of time spent on criminal activities.

To better measure how economic welfare might influence crime, it seems reasonable to include both unemployment and inflation in the empirical analysis. Estimating the impacts separately can result in a loss of vital information and issues of misspecification. But, when investigated jointly, these important effects pose econometric problems. Specifically, Ralston (1999) provides evidence that including both unemployment and inflation in a multivariate regression on crime is likely to encounter the issue of multicollinearity, given the traditional inverse relationship between unemployment and inflation. As such, Tang and Lean (2009) offer an excellent alternative: the authors use Okun's misery index, i.e., the sum of the unemployment rate and inflation rate. In this way, one is able to discern the net effect of inflation and unemployment on crime, while at the same time avoiding the misspecification errors in previous work. Tang and Lean uncover a link between economic misery and crime in the USA. Following suit, the authors of this paper opt to study the relationship between economic welfare and crime using the misery index, a more comprehensive metric than the rate of unemployment.

3. Data and Empirical Approach

3.1 Data

The paper uses quarterly data (1999Q1-2012Q3) on unemployment, inflation and crime (Property, Theft *from* Motor, Theft *of* Motor, Fraud, and Robbery).[1] Observations on crime were collected from the statistical unit of the Royal Barbados Police Force with the special permission of the Commissioner of Police, while those on inflation and unemployment were obtained from the Central Bank of Barbados databases.

3.2 Measuring the state of the variables

[1] Property crime includes residential burglary, commercial burglary, sacrilege, arson, attempted arson, and criminal damage. Robbery is theft from an individual.

In modelling the relationship between crime and economic variables, it is quite common to use a linear model—which by construction assumes a stable relationship between the variables. Although these models are quite successful in numerous applications, they are unable to capture cyclical patterns present in variables such as crime, inflation and unemployment. Indeed, there are several periods in which these variables deviate from their long-term trend or steady state values. Hence, a linear model might provide a weak fit. As such, this paper follows Fallahi and Rodríguez (2010) and focuses on modelling the cyclical behaviour of the variables under the consideration. The Markov-switching (MS) model of Hamilton (1989) is used identify the various states or cyclical behaviour of the economic misery and crime variables.

In this paper, we begin with a simple MS vector autoregressive model of order *k*, written as:

$$y_t = \alpha(s_t) + \sum_{t=1}^{k} \beta_k y_{t-i} + \varepsilon_t \qquad (1)$$

where α is the regime switching intercept, s_t is the variable denoting the regime, β_k are the coefficients on the autoregressive terms and ε_t is the error term. By allowing the intercept to depend on the cycle, the model implicitly assumes a smooth transition from one state to the next.

Following Hamilton (1989), the state variable, s_t, is represented as an unobserved discrete-time, discrete-state Markov process. The transition probability matrix is such that:

$$P_{ij} = \Pr\left[s_t = j | s_{t-1} = i\right] \; with \sum_{j=0}^{N} P_{ij} = 1 \quad for\ all\ i \qquad (2)$$

The MS intercept model specified in equation (1) can be easily extended to allow for more general dynamic structures. For instance, regime switching can occur in the autoregressive regressive parameters, in the error variance (heteroskedasticity), and in the coefficients of any other included exogenous regressors.

The estimation of equations is undertaken using the expectation maximization algorithm discussed in Hamilton (1990). In addition, the smoothing algorithm of Kim (1994) is employed to assign probabilities to the unobserved state conditional on the information set. Davies' (1987) upper bound for the significance of the likelihood ratio is used to choose the optimal number of regimes. The lag lengths are selected based on misspecification tests, parameter constancy tests, encompassing tests and information criteria. A similar process is used to choose between dynamic structures of the MS models.

3.3 Measuring the degree of synchronization

Once the "state" of the variables in each time observation is identified, the degree of synchronization between the variables is investigated. We employ the concordance index of Harding and Pagan (2002) to determine the fraction of time that the misery index and the crime variables are in the same state. For two series y_t and x_t, the index can be calculated as:

$$\hat{I} = \frac{1}{T}\left\{\sum_{t=1}^{T} S_{xt}S_{yt} + \sum_{t=1}^{T}(1 - S_{xt})(1 - S_{yt})\right\} \qquad (3)$$

where (S_{xt}, S_{yt}) are binary variables that take on a value of 1 when the y_t and x_t variables are in a particular state (say s_1) and 0 when they are not. Harding and Pagan (2002) suggest that if $\hat{I} = 1$, the series are procyclical, and if $\hat{I} = 0$, the series are countercyclical. Several issues arise: what if $0 < \hat{I} < 1$; how high/low should $\hat{I}$ be to interpret it as procyclical/countercyclical; and how does one determine if the synchronization is statistically significant? To address these issues, Harding and Pagan (2006) suggest estimating the following regression:

$$\hat{\sigma}_{s_x}^{-1}\hat{\sigma}_{s_y}^{-1}S_{yt} = \alpha + \rho_s\hat{\sigma}_{s_x}^{-1}\hat{\sigma}_{s_y}^{-1}S_{xt} + \xi_t \qquad (4)$$

where ρ_s is the correlation coefficient. If $0 < \rho_s \leq 1$, then the series are procyclical, and if $-1 \leq \rho_s < 0$, the series are countercyclical. In addition, the statistical significance of the relationship is tested using the *t*-statistic on $\hat{\sigma}_{s_x}^{-1}\hat{\sigma}_{s_y}^{-1}S_{xt}$. Harding and Pagan (2006) also note that when $\rho_s = 0$, the error term inherits the serial correlation properties of S_{yt}. Thus, inferences must be made robust to the serial correlation, as well as any heteroskedasticity in the errors. Hence, we adopt the Newey-West HAC method for standard errors.

4. Results

The presence of non-stationary variables in econometric analysis can lead to spurious results. Hence, as a preliminary step to the empirical analysis, the order of integration is determined. The authors employ the familiar augmented Dickey-Fuller and Phillips-Perron unit root tests. The results (Table 1) suggest that Theft of Motor, Theft from Motor and Fraud crime series are stationary. The Property and Robbery variables are trend stationary; hence a trend is included in the univariate MS model. Finally, the misery index is I(1), and is differenced once before estimating its univariate MS model.

INSERT TABLE 1 ABOUT HERE

Table 2 presents the results of the univariate MS models for each variable. For the Property, Theft from Motor, Theft of Motor vehicles and Fraud crime series, only the intercepts are regime-dependent. For the misery index, the intercept and the variance are regime-dependent, while for Robbery, the intercept, variance and autoregressive coefficients are regime-dependent. Each variable can be characterized by two states: s_0 and s_1. Based on the coefficients of the intercepts (and analysis of the regime classifications), for the misery index, state s_0 relates to periods of declining misery, while for the crime variables, s_0 appears indicative of states of low criminal activity. It follows that state s_1 relates to periods of expanding economic misery, while for the crime variables, this state corresponds to periods of high criminal activity.

INSERT TABLE 2 ABOUT HERE

Table 2 also provides the expected duration for each state. For each variable the duration s_1 is greater than that of s_0. The non-linear specification seems to provide a better fit than the linear models, as evidenced by the *p*-values associated with the LR chi-square tests and the approximate upper bound for significance. The models also appear to be well specified as suggested by tests for normality and autocorrelation.

Using the regime classifications of the MS models, the concordance index and estimated correlation is calculated for economic misery and the five crime variables (Table 3). Looking first at the contemporaneous relationship, the concordance index is smaller than 0.5 for each variable, suggesting that crime and misery are not often in the same regime. The correlation coefficients between economic misery and Property crime, Theft of Motor, Fraud and Robbery are each positive, indicating a procyclical relationship between each of these crimes and economic misery. The only type of crime to buck this trend is Theft from Motor, whose correlation coefficient hints at a countercyclical relation between economic misery and theft from motor. To determine if these relationships are statistically significant, the *t*-ratios are estimated. As shown in Table 3, the *t*-statistics are all insignificant at conventional levels of testing. Hence, there is no evidence of a contemporaneous relationship between the state of economic misery and crime.

INSERT TABLE 3 ABOUT HERE

It is possible that crime may have a lagged response to economic misery. Thus, we re-estimate the concordance index and correlation coefficients using lags of the misery index; that is, we assume that changes in the state of misery at *t-i* can possibly be related to the state of crime in period *t*. As in the contemporaneous case, there is no evidence of significant relationships between lagged values of economic misery and Theft from Motor, Fraud or Robbery. However, the lagged misery index appears to have a positive and significant impact on both Property crime and Theft of Motor, hinting that the criminal motivation effect identified by the Becker-Ehrlich type models is stronger than the criminal opportunity effect of Cantor and Land (1985). Moreover, the concordance index suggests that economic misery is in the same regime as Property crime approximately 50 percent of the time, and with theft from motor 58.9 percent of the time; however, the relationships are very short lived, disappearing after one quarter.

INSERT TABLE 4 ABOUT HERE

We also calculate separate concordance indices for the unemployment and inflation rates, to allow for comparison with the results of the misery index (Tables 4 and 5). Similar to the case of the misery index, there is no evidence of a statistically significant contemporaneous relationship between unemployment and the five types of crime analysed in this paper. However, there is evidence of a strong procyclical contemporaneous relationship between inflation and Property crime, lasting for up to two quarters. The results also suggest that it takes three quarters for unemployment to have an effect on Theft of Motor crime, and the impact is negative, lending credence to the criminal opportunity hypothesis. Moreover, Fraud-related crime (which has no relationship with the misery index) are significantly concordant with unemployment at a lag of one quarter.

INSERT TABLE 5 ABOUT HERE

5. Concluding Remarks

This paper combines two appealing aspects of the literature on economic conditions and criminal activity to examine the small island developing country, Barbados. First, we employ an index of misery that takes into account not only the rate of unemployment, but also the rate

of inflation within the country as a practical indicator of economic conditions. From a sound theoretical basis that suggests both unemployment and inflation have a strong correlation with crime, we solve some of technical issues encountered by previous research by combining them to form Okun's misery index. Second, we examine the nonlinearity of the relationship between economic misery and crime in Barbados by modelling the cyclical behaviour of the variables using Markov-Switching models and measuring the synchronization of their cycles via the concordance index. This deviates from the tradition of examining linear relationships on the basis that the variables under investigation are inherently cyclical and linear analysis is likely to provide a weak fit under these circumstances.

No evidence of a contemporaneous relationship between the state of economic misery and crime was uncovered. On the other hand, Property and Theft of Motor crimes respond to the state of misery with a lag of one period, lending support to the criminal motivation effect. Economic misery (lagged one period) is in the same regime as Property crime 50 percent of the time, and Theft from Motor crime almost 60 percent of the time. There is a strong procyclical contemporaneous relationship between inflation and Property crime, lasting up to two periods. Unemployment's impact on Theft of Motor crime manifests after three periods, and supports the criminal opportunity hypothesis. Finally, Fraud-related crimes and unemployment at a lag of one period are concordant.

The typical demand side expansionary policies to reduce the state of misery may not have the desired effect on crime as reducing the unemployment rate may indirectly increase the inflation rate, at least in the short run, according to the Phillips curve relationship, and could lead to an increase in the rate of crime. For the same reason, policies to tackle inflation could result indirectly in an increase in crime. The precise impact will depend on the relative impact of each component on the state of misery. The most promising course of action may be supply side policies, designed to improve the long-run performance of the economy; for example, increasing the productivity of labour by investment in training of the labour force and improvements in the quality of management, expanding the capital stock, and improvement in business efficiency, among others.

References

Altindag, D. 2012. Crime and unemployment: Evidence from Europe. *International Review of Law and Economics* 32(1): 145-157.

Becker, G. 1968. Crime and punishment: An economic approach. *Journal of Political Economy* 76(2): 169-217.

Buonanno, P. and D. Montolio. 2008. Identifying the socio-economic and demographic determinants of crime across Spanish provinces. *International Review of Law and Economics* 28(2): 89-97.

Cantor, D., and K. Land. 1985. Unemployment and crime rates in the post-World War II United States: A theoretical and empirical analysis. *American Sociological Review* 50(3): 317-332.

Davies, R. B. 1987. Hypothesis testing when a nuisance parameter is present only under the alternative. *Biometrika* 74(1): 33-43.

Devine, J., J. Sheley, and D. Smith. 1988. Macroeconomic and social-control policy influences on crime rate changes, 1948-1985. *American Sociological Review* 53(3): 407-420.

Di Tella, R., R. MacCulloch, and A. Oswald. 2001. Preferences over inflation and unemployment: Evidence from surveys of happiness. *American Economic Review* 91(1): 335-341.

ECLAC. 2013. *Economic survey of Latin America and the Caribbean*. Port of Spain: Economic Commission for Latin America and the Caribbean.

Ehrlich, I. 1973. Participation in illegitimate activities: A theoretical and empirical investigation. *The Journal of Political Economy* 81(3): 521-565.

Elliot, C., and D. Ellingworth. 1996. The relationship between unemployment and crime: A cross-sectional analysis employing the British Crime Survey 1992. *International Journal of Manpower* (6/7): 81-88.

Elliot, C. and D. Ellingworth. 1998. Exploring the relationship between unemployment and property crime. *Applied Economics Letters* 5(8): 527-530.

Hamilton, J.D. 1989. A new approach to the economic analysis of non-stationary time series and the business cycle. *Econometrica* 57(2): 347-384.

Hamilton, J.D. 1990. Analysis of time series subject to changes in regime. *Journal of Econometrics* 45(1-2): 30-70.

Harding, D., and A. Pagan. 2002. Dissecting the cycle: A methodological investigation. *Journal of Monetary Economics* 49(2): 365-381.

Harding, D., and A. Pagan. 2006. Synchronization of cycles. *Journal of Econometrics* 132(1): 59-79.

ILO. 2013. *Global employment trends 2013: Recovering from a second jobs dip*. Geneva: International Labour Organization.

Jackman, M. 2012. Revisiting the tourism-led growth hypothesis for Barbados: A disaggregated Market Approach. *Regional and Sectoral Economic Studies* 12(2): 15-26.

Kim, C. 1994. Dynamic linear models with Markov-switching. *Journal of Econometrics* 60(1-2): 1-22.

Lorde, T., B. Francis, and L. Drakes. 2011. Tourism services exports and economic growth in Barbados. *The International Trade Journal* 25(2): 205-232.

Lorde, T., and M. Jackman. 2013. Evaluating the impact of crime in tourism in Barbados: A transfer function approach. *Tourism Analysis* 18(2): 183-191.

Melick, M. 2003. The relationship between crime and unemployment. *The Park Place Economist* 11(10) Article 13: 30-36.

Papps, K., and R. Winkelmann. 2000. Unemployment and crime: New evidence for an old question. *New Zealand Economic Papers* 34(10): 53-72.

Ralston, R.W. 1999. Economy and race; Interactive determinants of property crime in the United States, 1958-1995: Reflection on the supply of property crime. *American Journal of Economics and Sociology* 58(3): 405-434.

Raphael, S., and R. Winter-Ebmer. 2001. Identifying the effect of unemployment on crime. *Journal of Law and Economics* 44(1): 259-283.

Tang, C. 2009. The linkages among inflation, unemployment and crime rates in Malaysia. *International Journal of Economics and Management* 3(1): 50-61.

Tang, C. and H. Lean. 2009. New evidence from the misery index in the crime function. *Economic Letters* 102(2):112-115.

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

Uggen, C. 2012. *Crime and the great recession*. Recession Briefs. Stanford, CA: Stanford Center on Poverty and Inequality.

Worrell, D., A. Belgrave, T. Grosvenor, and A. Lescott. 2011. An analysis of the tourism sector in Barbados. *Central Bank of Barbados Economic Review* 37(1&2): 49-78.

Young, T. 1993. Unemployment and property crime relationship: Not a simple American. *Journal of Economics and Sociology* 52(4): 413-416.

Table 1: Unit Root Tests

	Nature of the Test (level)	**ADF Test**		**PP Test**		**Order of Integration**
		Level	*1st Difference*	*Level*	*1st Difference*	
Misery Index	Trend and Intercept	-1.013	-4.025***	-2.637	-3.368***	I(1)
Property crime	Trend and Intercept	-4.123***	n.a.	-4.019**	n.a.	Trend Stationary
Theft of motor	Intercept	-3.076**	n.a.	-3.061**	n.a.	Stationary
Theft from motor	Intercept	-4.039***	n.a.	-3.911***	n.a.	Stationary
Fraud	Intercept	-4.976***	n.a.	-4.898***	n.a.	Stationary
Robbery	Trend and Intercept	-3.945**	n.a.	-3.807**	n.a.	Trend Stationary

Table 2: Results of Univariate Markov Switching Dynamic Regressions

	Misery Index	**Property Crime**	**Theft from Motor**	**Theft of Motor**	**Fraud**	**Robbery**
Intercept(s_0)	-0.776[0.293]	1.843[0.286]	0.248[0.030]	0.080[0.043]	0.155[0.034]	0.173[0.047]
Intercept (s_1)	2.329[0.107]	2.487[0.311]	0.337[0.042]	0.111[0.040]	0.254[0.052]	0.509[0.081]
$y_{t-1}(s_0)$	---------	---------	---------	---------	---------	0.269[0.140]
y_{t-1} (s_1)	---------	---------	---------	---------	---------	-0.303[0.208]
y_{t-1}	-0.051[0.053]	0.288[0.087]	0.524[0.116]	0.455[0.163]	0.245[0.071]	---------
y_{t-2}	-0.005[0.055]	---------	-0.344[0.098]	---------	---------	---------
y_{t-3}	-0.360[0.049]	---------	---------	---------	---------	---------
y_{t-4}	-0.394[0.051]	---------	---------	---------	---------	---------
y_{t-5}	0.042[0.055]	---------	---------	---------	---------	---------
y_{t-6}	-0.295[0.051]	---------	---------	---------	---------	---------
y_{t-7}	0.025[0.048]	---------	---------	---------	---------	---------
Trend	---------	0.288[0.087]	---------	---------	---------	0.003[0.001]
$\sigma(s_1)$	1.434 [0.221]	0.183[0.022]	---------	0.014[0.019]	0.049 [0.008]	0.056[0.006]
$\sigma(s_2)$	0.315[0.068]	0.220[0.063]	---------	0.056[0.015]	0.155[0.029]	0.026[0.006]
σ	---------	---------	0.058[0.006]	---------	---------	---------
			Average duration in quarters			
s_0	3.10	8.00	39.00	2.82	3.50	43.00
s_1	1.78	3.50	11.00	2.09	1.09	5.50
			Specification tests – p-values			
LR-test (χ^2)	0.004	0.018	0.016	0.007	0.000	0.020
LR Upper-Bound	0.008	0.033	0.040	0.012	0.000	0.018
Normality	0.975	0.824	0.215	0.228	0.396	0.988
Autocorrelation	0.304	0.690	0.121	0.581	0.207	0.222

Note: standard errors are in squared parentheses.

Table 3: Concordance Index Statistics – Relationship between the Misery Index and Crime

	Property Crime	**Theft from Motor**	**Theft of Motor**	**Fraud**	**Robbery**
Contemporaneous					
Concordance Index	0.468	0.383	0.489	0.468	0.426
$\hat{\rho}$	0.133	-0.026	0.075	0.133	0.219
t-statistic	1.110	-0.304	0.481	1.279	1.258
Lag 1					
Concordance Index	0.500	0.413	0.587	0.413	0.391
$\hat{\rho}$	0.205	0.041	0.279	0.013	0.064
t-statistic	1.926*	0.583	2.280**	0.095	0.536
Lag 2					
Concordance Index	0.422	0.400	0.444	0.444	0.356
$\hat{\rho}$	0.019	0.013	-0.030	0.082	-0.095
t-statistic	0.214	0.207	-0.192	0.807	-0.671
Lag 3					
Concordance Index	0.419	0.419	0.674	0.395	0.279
$\hat{\rho}$	-0.071	-0.018	0.143	0.089	-0.258
t-statistic	-0.682	-0.279	0.986	0.877	-1.208

Note: ***, ** and * represents significance at the 1, 5 and 10 percent levels of testing

Table 4: Concordance Index Statistics – Relationship between Unemployment and Crime

	Property Crime	**Theft from Motor**	**Theft of Motor**	**Fraud**	**Robbery**
Contemporaneous					
Concordance Index	0.373	0.451	0.490	0.431	0.333
$\hat{\rho}$	-0.044	0.144	0.083	0.117	-0.061
t-statistic	-0.266	0.905	0.734	1.099	-0.503
Lag 1					
Concordance Index	0.340	0.420	0.440	0.480	0.340
$\hat{\rho}$	-0.091	0.107	-0.040	0.278	-0.004
t-statistic	-0.405	0.669	-0.250	3.728***	-0.028
Lag 2					
Concordance Index	0.347	0.408	0.388	0.408	0.327
$\hat{\rho}$	-0.086	0.086	-0.157	0.086	-0.029
t-statistic	-0.505	0.546	-0.939	0.772	-0.178
Lag 3					
Concordance Index	0.354	0.396	0.333	0.375	0.313
$\hat{\rho}$	-0.080	0.063	-0.277	-0.008	-0.055
t-statistic	-0.466	0.412	-2.350**	-0.103	-0.532

Note: ***, ** and * represents significance at the 1, 5 and 10 percent levels of testing

Table 5: Concordance Index Statistics – Relationship between Inflation and Crime

	Property Crime	**Theft from Motor**	**Theft of Motor**	**Fraud**	**Robbery**
Contemporaneous					
Concordance Index	0.652	0.565	0.478	0.522	0.587
$\hat{\rho}$	0.253	0.070	-0.067	-0.010	0.103
t-statistic	1.832*	0.772	-0.436	-0.084	1.001
Lag 1					
Concordance Index	0.711	0.600	0.511	0.556	0.556
$\hat{\rho}$	0.360	0.120	-0.010	0.040	0.020
t-statistic	2.406**	1.160	-0.086	0.383	0.259
Lag 2					
Concordance Index	0.636	0.591	0.455	0.568	0.523
$\hat{\rho}$	0.196	0.078	-0.137	0.051	-0.067
t-statistic	1.767*	0.948	-0.811	0.479	-0.835
Lag 3					
Concordance Index	0.581	0.581	0.605	0.605	0.488
$\hat{\rho}$	0.062	0.031	0.164	0.102	-0.160
t-statistic	0.684	0.475	1.061	1.179	-1.316

Note: ***, ** and * represents significance at the 1, 5 and 10 percent levels of testing