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## **Terrorist murder, cycles of violence, and terrorist attacks in New York City during the last two centuries**

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20. January 2007

Online at <http://mpra.ub.uni-muenchen.de/4200/>  
MPRA Paper No. 4200, posted 22. July 2007

# **Terrorist Murder, Cycles of Violence, and Terrorist Attacks in New York City During the last Two Centuries.**

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Paper for the Stockholm Criminology Symposium  
Stockholm University 2008  
*Section on National Crime Prevention Strategies*

**Abstract:** I apply the Beveridge-Nelson business cycle decomposition method to the time series of murder of New York City – NYC (1797-2005). Separating out “permanent” from “cyclical” murder, I hypothesize that the cyclical part coincides with documented waves of organized crime, internal tensions, breakdowns in social order, crime legislation, social, and political unrest, and recently with the periodic terrorist attacks in the city. The estimated cyclical terrorist murder component warns that terrorist attacks in New York City from 1826 to 2005, historically occur in the estimated turning point dates, of whether a declining, or ascending cycle, and so, it must be used in future research to construct a model for explaining the causal reasons for its movement across time, and for forecasting terrorist murder and attacks for New York City.

**Keywords:** A model of cyclical terrorist murder in Colombia, 1950-2004. Forecasts 2005-2019; the econometrics of violence, terrorism, and scenarios for peace in Colombia from 1950 to 2019; scenarios for sustainable peace in Colombia by year 2019; decomposing violence: terrorist murder in the twentieth in the United States; using the Beveridge and Nelson decomposition of economic time series for pointing out the occurrence of terrorist attacks, decomposing violence: terrorist murder, and attacks in New York State from 1933 to 2005.

*JEL classification codes:* C22, D74, H56, N46, K14, K42, N42, O51.

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The opinions expressed do not compromise the company for which I currently work.

**DRAFT, VERY FIRST VERSION (January 20th, 2007).**

## **Terrorist Murder, Cycles of Violence, and Terrorist Attacks in New York City During the last Two Centuries.**

### **1. Introduction.**

After decomposing violence, and creating the cyclical terrorist murder and attacks index for New York State: *decomposing violence: terrorist murder and attacks in New York State* (Gómez-Sorzano 2006E), this paper continues that methodology research applied at the City level. The current exercise for New York City is the first one at decomposing violence at the city level on the purpose of constructing murder and attacks indexes preventing the closeness of attacks, or tragic events in the main cities of the U.S.

This research shows that the estimated cyclical component of murder carefully has pointed out through estimated turning point dates the tragic events occurred in New York City from 1826 to 2005. The indicator for the city carefully signaled the terrorist attacks, particularly, the World Trade Center bombing, and 9/11 2001; the paper suggests that the City of New York has been able to break up the cycle of violence having a current problem of growing permanent murder (i.e., the estimated permanent component of murder increases, Fig. 5).

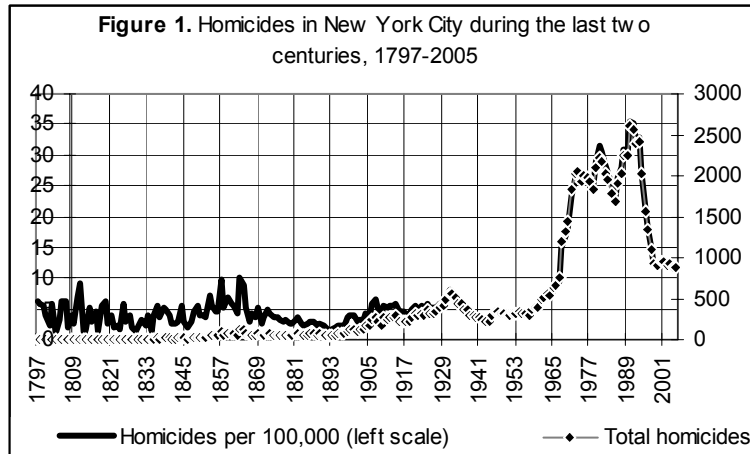
According to the Federal Bureau of Investigation, Uniform Crime Reporting System, total homicides in New York City increased from an average of 4 homicides per year for the period (1797 to 1815)<sup>1</sup> the so called War of 1812 period (war fought between the United States and the United Kingdom and its colonies, especially upper Canada (Ontario), lower Canada (Quebec), Nova Scotia and Bermuda; to 27 for (1816-1865)<sup>2</sup> during this period ends up the American Civil War (1861-1865); then to 113 murders per year, period (1866-1918) coinciding with the ending up of the First World War lasting from 1914-1918; then jumping to 350 for the period (1919-1945) a period marked by the end of the Second World War; to 760 for (1946-1975); and to 1,713 for (1976-2005) a period marked by the end of the Vietnam Conflict.

When adjusted for population growth, i.e., homicides in 100,000 people in the population, and again marking the periods in identical way as done by Monkkonen (2001), by the cessation of every U.S war, a dramatic picture emerges for the six periods as follows: 4.26 per capita, 4.23, 3.55, 5.18, 9.79, and 23.40 for the last period that includes the war against global terrorism (Fig.1).

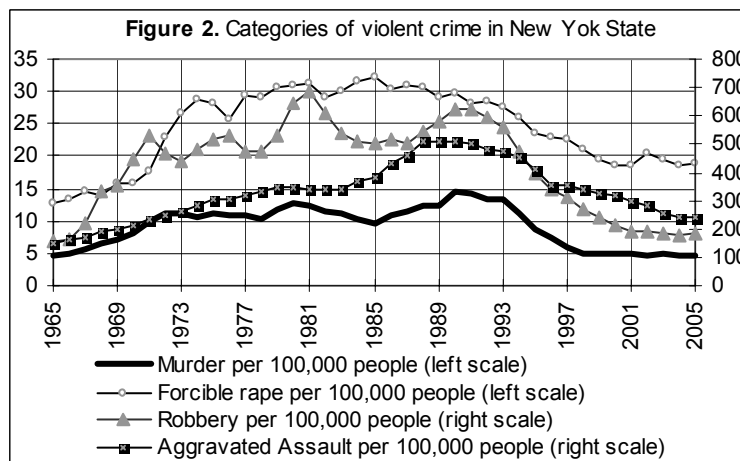
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<sup>1</sup> When the war had finished 1600 British, and 2260 American troops had died.

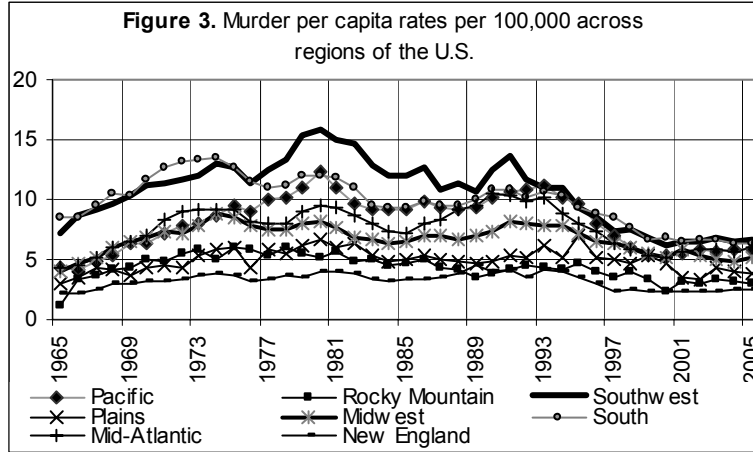
<sup>2</sup> It was a major war between the United States, the "Union", and eleven southern States which declared that they had a right to secession, and formed the Confederate States of America.



Out of the state’s four categories of crimes, measuring violent crime (murder, forcible rape, robbery, and aggravated assault) murder is the one that varies the less showing and stabilization tendency (Fig. 2).



Although the U.S., murder rates appear stabilizing during the last years, the highest per capita rates are found in the southwest, and south regions with 6.67, and 6.39 per capita, the Mid-Atlantic region where New York State belongs appears as the third highest of the country with a rate of 5.93 for 2005 (Fig. 3).



## 2. Construction of the per capita murder series for New York City.

Since it does not exist, the data series of murder per capita for New York City; a reconstruction for such a series is performed using the total murder series from Monkkonen (2001), and the statistics for population for New York City taken from Historical Statistics of the United States, Volume 1<sup>3</sup>. This volume presents the information for population for New York City as comprised by the subpopulations of Bronx, Brooklyn, Manhattan, and Queens, the information starts in 1797 up to 1990. The information shown is the inter-census population having holes of 10 years; so accordingly a reconstruction for population was accomplished using the standard exponential calculation of population growth<sup>4</sup>. Table 1 and Figure 4 present respectively the inter-census population growth rates, and the estimated population.

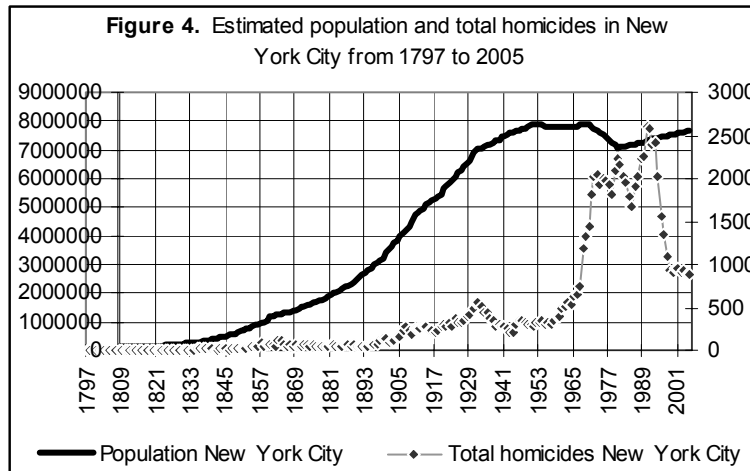
| Period    | Rate |
|-----------|------|
| 1790-1800 | 4.29 |
| 1800-1810 | 3.75 |
| 1810-1820 | 2.17 |
| 1820-1830 | 4.23 |
| 1830-1840 | 4.35 |
| 1840-1850 | 5.24 |
| 1850-1860 | 4.75 |
| 1860-1870 | 2.08 |
| 1870-1880 | 2.33 |

<sup>3</sup> Table Aa832-1013 Population of cities with at least 100,000 population in 1990 (1790-1990). Source U.S., Bureau of the Census, 1990 Census of Population and Housing “population and housing unit counts”, number CPH-2-1, table 46.

<sup>4</sup>  $P_F = P_0 e^{rt}$ , where PF stands for final population, P0 initial population, r is the inter-census rate, and t as time comprised between two consecutive census.

|           |                   |
|-----------|-------------------|
| 1880-1890 | 2.46              |
| 1890-1900 | 2.86              |
| 1900-1910 | 2.97              |
| 1910-1920 | 1.49              |
| 1920-1930 | 1.90              |
| 1930-1940 | 0.66              |
| 1940-1950 | 0.51              |
| 1950-1960 | -0.12             |
| 1960-1970 | 0.13              |
| 1970-1980 | -1.00             |
| 1980-1990 | 0.31 <sup>5</sup> |

The data series for total homicides of Figure 4 is chained between Monkkonen (2001), and the FBI Crime Reporting System. Monkkonen is source 1797-1967, while 1968 to 2005 is FBI Crime Reporting System. The reconstructed per capita murder series per 100,000 people calculated as the quotient between murder and population multiplied per 100,000 is finally shown in Figure 1, and accurately coincides with the graphical account of U.S. wars, and murder in New York City, shown in Fig 1.5 pp. 19 Monkkonen (2001).



## 2. Data and methods

For this analysis I use the reconstructed murder rates per 100,000 people shown in figure 1. As is known, time series can be broken into two constituent components, the permanent and transitory component. I apply the Beveridge-Nelson (BN for short 1981) decomposition technique to the New York City series of murders. The estimated cyclical component contains the turning points dates, the information for terrorist attacks for the city are hidden in these cycles, particularly coinciding with the turning point dates.

<sup>5</sup> The population from 1991 to 2005 was extrapolated using this rate.

**Beveridge and Nelson decomposition**

I use the augmented Dickey Fuller (1981), test to verify the existence of a unit root on the logarithm of murder 1797-2005. It presents the structural form shown in equation (1).

$$\Delta L \text{ hom}_t = \alpha + \theta \cdot t + \phi L \text{ hom}_{t-i} + \sum_{i=1}^k \gamma_i \Delta L \text{ hom}_{t-i} + \varepsilon_t \quad (1)$$

The existence of a unit root, is given by (phi)  $\phi=0$ . I use the methodology by Campbell and Perron (1991) in which an auto-regression process of order k is previously selected in order to capture possible seasonality of the series, and lags are eliminated sequentially if: a) after estimating a regression the last lag does not turn out to be significant, or b) if the residuals pass a white noise test at the 0.05 significance level. The results are reported on Table 2.

Table 2 Dickey & Fuller test for Unit Roots

| Series                       | K  | Alpha  | Theta  | Phi     | Stationary |
|------------------------------|----|--------|--------|---------|------------|
| D(Lhnewyo) – murder series   | 25 | 0.1253 | 0.0011 | -0.1583 | No         |
| City of New York , 1797-2005 |    | (2.27) | (2.15) | (-3.07) |            |

Notes: 1. K is the chosen lag length. T-tests in parentheses refer to the null hypothesis that a coefficient is equal to zero.

Under the null of non-stationarity, it is necessary to use the Dickey-Fuller critical value that at the 0.05 level, for the t-statistic is -3.50 , -3.45 (sample size of 50 and 100)

After rejecting the null for a unit root (accepting the series is non stationary), I perform the BN decomposition which begins by fitting the logarithm of the per capita murder series to an ARIMA model of the form (2):

$$\Delta L t \text{ hom}_t = \mu + \sum_{i=1}^k \gamma_i \Delta L t \text{ hom}_{t-i} + \sum_{i=1}^h \psi_i \varepsilon_{t-i} + \varepsilon_t \quad (2)$$

Where k, and h are respectively the autoregressive and moving average components. The selection of the ARIMA model is computationally intense. My search for the right model for the two century period 1797-2005 stopped with an ARIMA (28,1,16) ran with RATS 4, shown in table 3, and including autoregressive components of order 1,2,6 and 28<sup>6</sup>, and moving average terms of order 6,14 and, 16; the model is unique at providing a cyclical component oscillating around a zero average, and

<sup>6</sup> The same autoregressive structure used at the State level e.g., Decomposing violence: terrorist murder in New York State from 1933 to 2005. online at [http://mpr.ub.uni-muenchen.de/3776/01/MPRA\\_paper\\_3776.pdf](http://mpr.ub.uni-muenchen.de/3776/01/MPRA_paper_3776.pdf)

coinciding amazingly well with mayor cycles of violence, and most importantly terrorist attacks occurred in New York City:

*Table 3. Estimated ARIMA model for murder for New York City*

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Annual data from 1797 to 2005

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| Variables | Coeff   | T-stats | Std Error | Signif |
|-----------|---------|---------|-----------|--------|
| Constant  | 0.0058  | 2.88    | 0.0020    | 0.0044 |
| AR(1)     | -0.2171 | -4.53   | 0.0470    | 0.0000 |
| AR(2)     | -0.1193 | -2.55   | 0.0460    | 0.0115 |
| AR(6)     | 0.5620  | 13.16   | 0.0420    | 0.0000 |
| AR(28)    | 0.1155  | 3.55    | 0.0320    | 0.0000 |
| MA(6)     | -0.7897 | -10.86  | 0.0720    | 0.0000 |
| MA(14)    | -0.2201 | -3.58   | 0.0610    | 0.0000 |
| MA(16)    | -0.2980 | -4.96   | 0.0600    | 0.0000 |

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Centered R<sup>2</sup> = 0.91  
 DW= 2.09  
 Significance level of Q = 0.013  
 Usable observations = 180

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The eight model parameters are replaced in the equation for the permanent component of murder shown in (3)<sup>7</sup>:

$$L \text{ hom}_t^{PC} = L \text{ hom}_0 + \frac{\mu \cdot t}{1 - \gamma_1 - \dots - \gamma_k} + \frac{1 + \Psi_1 + \dots + \Psi_h}{1 - \gamma_1 - \dots - \gamma_k} \sum_{i=1}^t \varepsilon_i \quad (3)$$

The transitory or cyclical terrorist murder estimate is found by means of the difference between the original series, and the exponential of the permanent per capita component ( $L \text{ hom}_t^{PC}$ )<sup>8</sup>, and is shown in Figure 5, that shows additionally the estimated permanent component. The estimated cyclical index matches qualitative description of known waves of organized crime, internal tensions, crime legislation, social, and political unrest overseas, and disentangles the timing for terrorist attacks, and terrorist murder in the City of New York. To compare this historical narrative of events with my estimates for cyclical terrorist murder, and attacks I use chronologies, and description of facts taken from Clark (1970), Dosal (2001), Durham (1996), Blumstein and Wallman (2000), Bernard (2002), Hewitt (2005), Monkkonen (2001), Wikipedia; the Spanish Division Library of Congress for the Chronology of the Spanish-American War<sup>9</sup>, and Henrreta et al. (2006).

Figure 5A for informational purposes shows, the terrorist murder and attacks indicator for Colombia, and New York City; it is noticeable observing that both series

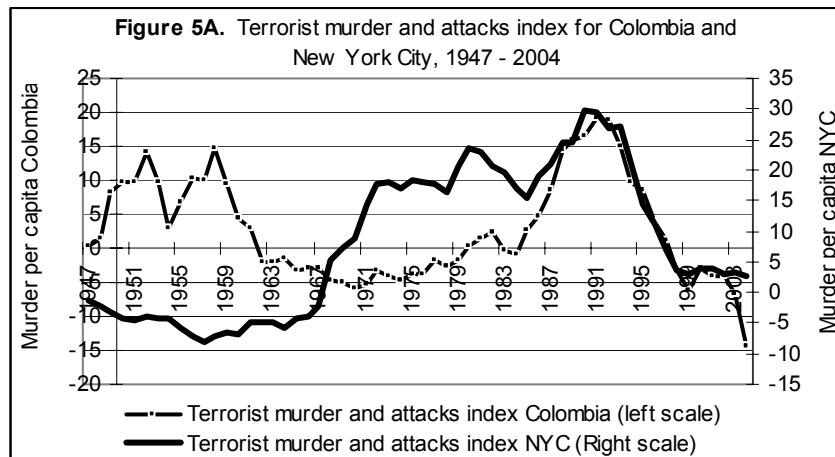
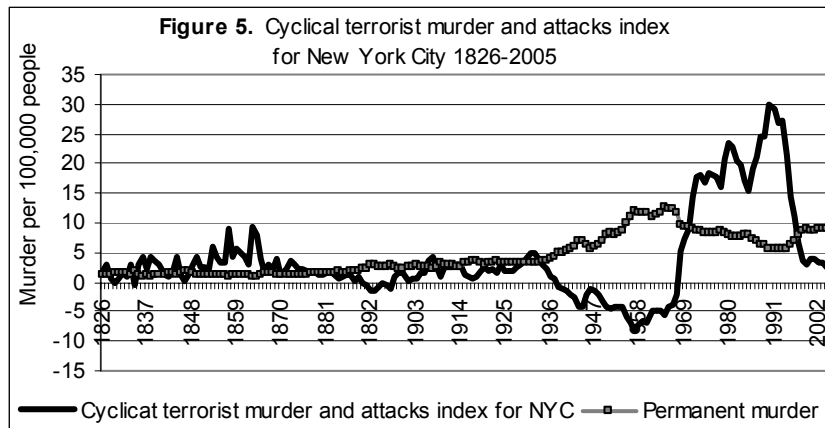
<sup>7</sup> The extraction of permanent and cyclical components from the original series is theoretically shown in BN (1981), Cuddington and Winters (1987), Miller (1998), Newbold (1990), and Cárdenas (1991). I show the mathematical details for New York City in appendix A. Eq.3 above, turns out to be Eq.17 in appendix A.

<sup>8</sup> Turning the estimated permanent per capita component into the level of the permanent component.

<sup>9</sup> <http://www.loc.gov/rr/hispanic/1898/chronology.html>.



move in an identical way from 1971 onwards, but the index for New York City has always been bigger compared with Colombia.



### 3. Interpretation of the terrorist attacks index for New York City.

The terrorist murder and attacks indicator for New York City presents as a whole 7 main cycles. Four descending and three ascending ones as follows:

Descending cycle, 1826-1834 (an eight year period) characterized by political violence in New York

This period coincides with New York City election riots of April 1834. The index decreased from 1833 to 1834 from 2.81 per capita, to -0.33, and then jumped abruptly after the riots on 1835 to 2.78.

Ascending cycle, 1835-1863 (a 29 year period). Marked by Holiday violence, the New York City Draft riots, the Mexican War 1846-1848, and the Civil War 1861-1865.

According to Monkonnen p.p. 130, in the nineteenth century , holidays such as Christmas were a time for murder during the mid 1830s, the index effectively jumps from 1835 to 1836 from 2.78 to 4.39 (57.8%), and from 1837 to 1838 from 2.39 to 4.24 (77.4%).

This period also coincides with the Mexican War from 1846 to 1848; according to the U.S. Department of Defense, the total number of military serving during this war was 78,718, having a total of 13,283 deaths, composed by 1,733 battle deaths and 11,500 other deaths; wounds no mortal accounted for 4,152. My NYC index effectively carefully points out a increase in pressure, and so goes up passing from 0.04 in 1846 to 1.12 in 1847 (241.6% change); then jumps again in 1848 to 3.09 (an additional increase of 173.7%)

Monkonnen (2001, pp122) particularly refers to the years of 1857 and 1858 as a period of intense political violence, the index effectively moves from 1856 to 1857 from 3.25 to 4.17 per capita (171.3% change).

This period is additionally marked by the Civil War 1861-1865. According to the U.S Department of Defense the number of military serving during this period (Union Forces only) was 2.213.363, having total deaths of 364,511, composed by 140,414 battle deaths, and 224,097 other deaths, wounds not mortal accounted for 281,881. The NYC index accounted with amazing precision this increased pressure as follows: From 1862 to 1863 the index passes from 2.92 to 9.26 (216.3%), the pressure starts relieving, and moves down to 8.09 in 1864 (-12.5%), and to 4.01 in 1865 to mark the end of the war with an additional negative variation of 50.4%.

This period additionally is tragically marked by New York City draft riots; according to Monkonnen pp.137, African American men had worked on the city's docks, in its shipyards, and in various service occupations, they competed vigorously, and sometimes violently for those jobs, but the story culminated tragically in 1863 with the New York City Draft Riots, according to him the riots contained a base element of racism. Angered by the efforts to draft poor and immigrant workers, the city's white immigrant men quickly turned their initial political protest into a race war against African Americans, as a consequence a large number of black residents died, many victims of vicious public lynchings; the index effectively, and accordingly registers in 1863 a value of 9.26 (a change of 216.3% with respect to 1862)

Descending cycle 1864-1897 (a 33 year period), characterized by Post American civil war period.

The period is marked by the elections of November 8, 1870. From 1868 to 1869 the index jumped from 2.15 to 4.06 per capita (a 88.6% change), and then decreased in 1870 to 1.24 (a -69.3% change)

Ascending cycle 1898-1931 (a 34 year period), period marked by the Spanish American War (1898-1902), and frequent U.S overseas invasions<sup>10</sup>.

According to Henretta et al., pp.623, this period perfectly coincides with the Roosevelt corollary to the Monroe Doctrine, that stated U.S intention to intervene unilaterally in Latin America, as well as forbid European intervention. It included the takeover of part of Colombia for the Panama Canal, numerous invasions 1898-1931, and coups to overthrow “unfriendly” governments also known as unilateralism.

According to Dosal (2002), the American Caribbean’s Wars began in Cuba in 1898 when the United States replaced Spain and England as the masters of the Caribbean, according to him during the opening Caribbean War (1898-1932), the US intervened frequently and directly with American troops.

The first Caribbean war was the Spanish American War declared between the US and Spain on 25 April 1898<sup>11</sup> lasting up to 1902, and comprising sub-wars for Cuba, Phillippines and Guam, and Puerto Rico.

The U.S. force appeared off Santiago de Cuba with more than 16,200 soldiers and a total of 153 ships, peace was signed on January 1, 1899, my index jumps from 0.90 to 1.67 from 1898 to 1899 (84.4% change). With the Phillippines the intention was to terminate Spaniard occupation, and to provide security to its inhabitants. Peace protocol was signed in Washington D.C. on August 12, terminating hostilities between United States and Spain in the war fronts of Puerto Rico, Cuba and the Phillippines

The war between the Phillippine Republic and the US, started on 4 February 1899 ending up in July 1902, according with the Hispanic Division, Library of Congress, it had more than 4,200 US soldiers and 20,000 and 200,000 Filipo soldiers and civilians deaths; respectively, my index jumps from 1901 to 1902, from 0.27 to 0.59 (118.4% change). Although the U.S. Department of Defense does not clearly set up limits for its duration, it reports that had 306,760 military serving, and a total of 2,446 deaths composed by 385 battle deaths, and 2,061 other deaths; wounds not mortal accounted for 1,662.

During this period, Bernard (2002, pp. 150) additionally reports that around 100,000 garment workers in New York City went on strike on 1913, at the same time that some 150,000 workers walked out in the women’s garment industries. Garment workers’ grievances stemmed from long hours, low wages and unsanitary conditions of work; this year my index passes from 2.64 to 3.0 (13.5%)

On May 15 1916 additionally marines occupied Monte Cristi and Puerto Plata in the Dominican Republic, the occupation ended in 1924 after having a democratically elected president in office. The index reports positive and negative oscillations during the period comprised from 1917 to 1926 as follows, from 1917 to 1918 moves from 0.39 to 0.80 (104.7%) to 1.84 in 1919 (127.6%), to 2.60 in 1920 (41.7%), 1.86 in 1921 (-28.6%), 2.27 in 1922 (22.4%), 1.43 in 1923 (-36.8%), 2.76 in 1924 (92.1%), 1.96 in 1925 (-28.7%), and 1.96 for 1926 (0%)

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<sup>10</sup> This period is called by Lester D. Langley as The Banana Wars: United States Intervention in the Caribbean (1898-1934).

<sup>11</sup> Chronology taken from: The World of 1898: The Spanish-American War, Hispanic Division Library of Congress. <http://www.loc.gov/rr/hispanic/1898/chronology.html>.

In 1918 in Haiti, and according to Dosal (2002), Charlemagne Peralte a Haitian nationalist, was leading an army of 5,000 cacos in 131 encounters with the American marines. My index effectively jumps from 0.39 in 1917 to 0.80 in 1918 (104.7%). Two marines infiltrated the cacos, as well as the encampment, and shot Peralte dead, which started and insurrection that continued after Peralte's death with at least 2,000 Haitians deaths.

During this period additionally, President Woodrow Wilson entered First World War in 1917. According to Bernard (2002, pp.325), there was Draft registration in New York City as mentioned earlier. After the US broke up diplomatic relations with Germany in early February, popular anti-German feelings intensified, especially after intercepting the telegram sent from Arthur Zimmerman, the German Foreign Minister, to Jonathan Bernstorff, the German Ambassador in the US, it revealed their government's decision to resume unrestricted submarine warfare. It was also suggested that Mexico would receive German assistance in the re-conquest of Texas, New Mexico and Arizona, if an alliance between the two countries could be secure. On 6 April 1917 the US finally declared war on the German government (rather than its subjects). From 1917 to 1918 effectively my index for attacks and terrorist murder jumped from 0.39 to 0.80 (104.7% change). According to the U.S. Department of Defense<sup>12</sup> during World War I (1917-1918) the US had a total of 116,516 deaths, composed by 53,402 battle deaths, and 63,114 other deaths; wounds not mortal accounted for 204,002.

The period additionally coincides with prohibition years. Henrretta et al describes it, as a government ban on hard liquor set up in 1917, a war measure enlarged by the 18<sup>th</sup> Amendment coming into full force as a ban on interstate commerce in beer or alcohol in 1920, and repealed in 1933. My index effectively takes into account prohibition years in New York City, and the U.S as a whole as years of increasing violence and its reduction for the whole U.S. came to happen years later after Amendment 18<sup>th</sup> was repealed e.g., Gómez-Sorzano (2006, pp.7).

For New York City, from 1917 to 1918 the index jumps from 104.7%, then in 1919 passes to 1.84 (127.6% change), to 2.60 in 1920 (41.7%); from 1921 to 1922 moves from 1.86 to 2.27 (22.4%); 1923 to 1924 passes from 1.43 to 2.76 (92.1%); 1927 to 1928 from 1.99 to 2.59 (30.1%); to 1930 3.65 (29.1% change); to 1931 4.92 (34.6%)<sup>13</sup>

Descending cycle 1932-1967. (a 36 year period), characterized by the ending up of Nicaragua's intervention 1927-1932; the U.S. Good Neighbor Policy period or Second phase of America's Caribbean War (1933-1945); the Korean War (1950-1953), World War II ( 1941-1946), the terrorist assassination of John F. Kennedy, and the beginning of Vietnam Conflict (1964).

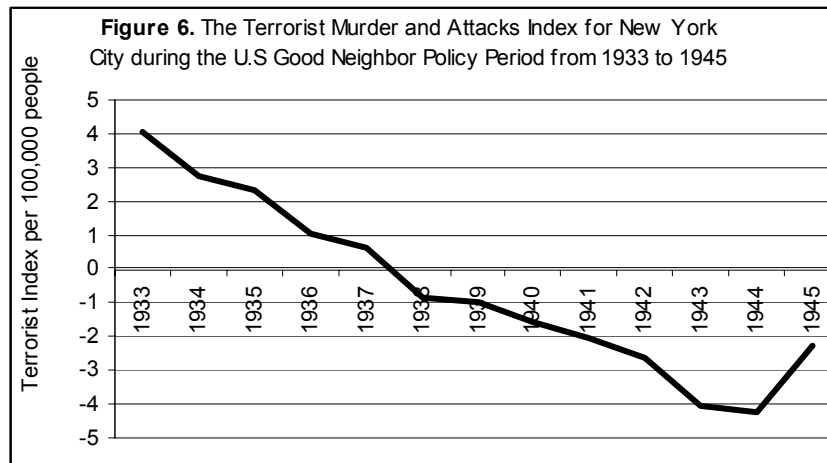
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<sup>12</sup> In its report: PRINCIPAL WARS IN WHICH THE UNITED STATES PARTICIPATED U.S. MILITARY PERSONNEL SERVING AND CASUALTIES.

<sup>13</sup> As curious fact , during the post Economic Depressions years from 1932 to 1937 my index drops continually, e.g., from 1931 to 1932 passes from 4.92 to 4.84 to 4.05 1933, to 2.76 in 1934 to 2.32 in 1935 to 1.04 in 1936 to 0.59 in 1937, which in percent changes gives -1.5 %, -16.2%, -31.8%, -15.8%, -55.2%, -42.7 %; from 1938 onward until 1967 the index becomes negative.

This period overlaps with Nicaragua’s intervention started in 1927, and escalated in 1929 after the U.S deployment of 5,000 marines. According to Dosal (2002), it was the largest American military deployment in the Caribbean prior to 1965. The war was unpopular and President Herbert Hoover withdrew the marines after supervising presidential elections of 1932. The NYC index effectively diminishes from 4.92 in 1931 to 4.84 in 1932 (-1.5%).

This period additionally coincides according to Dosal (2002) with strongmen maintaining order on behalf of American troops. General Somoza in Nicaragua and Trujillo in the Dominican Republic, the period was known as the U.S Good Neighbor Policy lasting from 1933 to 1945. My index amazingly capture this descending and peaceful period. Figure 6 shows an index that starts at 4.05 per capita, gets a minimum of -4.20 in 1944, and then jumps to -2.30 in 1945 at the end of the period.



According to Dosal (2002), this good neighbor policy said nothing about indirect interventions, so occupation and intervention by proxy became the norm. During this second phase of America’s Caribbean War, the Caribbean enjoyed relative peace at the high price of democracy, it was the time for dictators. Dictators Fulgencio Batista (1934-1944, 1952-1958), Trujillo (1930-1961), Jorge Ubico (1931-1944), Tiburcio Carías Andino (1932-1948), and Somoza (1934-1956) maintained domestic order so well in Cuba, the Dominican Republic, Guatemala, Honduras, and Nicaragua that the United States did not have to use its forces to protect American interests.

This period additionally coincides with World War II (1941-1946). During the war, the attacks index for NYC continually decreased, but jumped the year of the surrendering of Japan (on 2 September 1945) creating a turning point date; the attacks on Hiroshima and Nagasaki on August 6, and 9 respectively created an ascending cycle, the situation resembles 9/11 2001 terrorist attacks where the index for NYC was coming down but after been hit, the index peaked, and came down again for subsequent years e.g., see last cycle ahead in the text. After the nuclear attacks in Japan the NYC index for attacks increased from -2.30 in 1945 to -1.21 in 1946 (47.3% change), after 1946 the

index decreased additionally further getting its minimum value or most peaceful time for NYC in 1957 with -8.17 per capita.

This period for NYC, additionally coincides with the diminishing of the terrorist index for the nation as a whole e.g., the U.S index decreased from 1953 to 1959 from 0.81 per capita to 0.34 (Gómez-Sorzano 2006).

Additional U.S facts affecting the NYC index were the assassination of President Kennedy, which increased the index from -4.94 in 1962 to -4.82 in 1963 (2.4%); the shut down in power in the city on August 1965 additionally moved the index from -5.70 in 1964 to -4.12 in 1965 (27.7%)

The Korean War of 1950-1953. Apparently did not affect much the index for NYC which moved from -4.61 in 1950 to -4.04 in 1952 to -4.31 in 1953, and jumped in 1954 (-4.24) once the war was ended up.

The last part of this period coincides with the beginning of the Vietnam Conflict in 1964 ending up in 1973. During this period war or military conflict proves one more time, affects the terrorist index causing a quickly instantaneous ascension of it. Once the Vietnam conflict initiated the index continuously rose; from 1964 to 1965 it moved from -5.70 to -4.12 (27.7%); in 1966 to -3.95 (4.12%), in 1967 -2.22 (43.7%); it had a huge ascension in 1968 to 5.41, in 1969 to 7.36 (36%), this phenomenon coincides with what the U.S is experiencing after initiating the global war on terrorism; the terrorist index for the nation increases permanently, Gómez-Sorzano (2006).

Ascending cycle 1968-1990 (a 23 year period), characterized by the continuation of the Vietnam Conflict and its ending up in 1973; the assassination of Dr. Martin Luther King, the Invasion of Panama, and the war on drugs in Colombia 1985-1991.

This period is marked by the assassination of Martin Luther King, Jr. on 4 April 1968, the index moved from 1967 to 1968 from -2.22 to 5.41. During the Vietnam conflict years the index continuously grew up, and just stopped its climbing tendency once the conflict was over e.g., from 1968 to 1969 passed from 5.41 to 7.36 (36%); in 1970 moved to 8.92 (21%); in 1971 to 14.4 (62.2%), 1972 to 17.70 (22.3%), 1973 to 18.12 (2.3%), and decreased in 1974 to 19.90 (-6.7%); one more time, history confirms how periods of U.S. involvement in conflicts and wars are responsible for boosting the terrorist attacks indexes. According with the U.S Department of Defense, the Vietnam Conflict produced 58,209 total deaths composed by 47,424 battle deaths, and 10,785 other deaths; wounds not mortal accounted for 153,303.

A slight reduction for the NYC index appears coinciding in identical way with the reduction of the U.S attacks index (Gómez-Sorzano, 2006), I refer to the sub-period 1982-1986, the NYC index moves from 22.90 in 1981 to 20.55 (-10.28%) in 1982 to 19.68(-4.2%) in 1983, to 17.11 (-13.06%) in 1984, and to 15.49 (-9.4%) in 1985; (Blumstein and Wallman, 2002), refer to it as attributed to the aging of the population, as the huge baby-boom cohorts moved into adulthood, they brought down the total rate of homicide and other crimes.

Additional facts include U.S military invasion of Panama arresting Manuel Noriega in 1989; the NYC index accordingly moves passing from 24.66 to 29.88 in 1990 (21.1%), during this ascending cycle the war on drugs in Colombia worsens from 1985 to

1991, the index moves from 15.49 in 1985 to 19.04 in 1986 (22.9%), to 21.02 in 1987 (10.3%), to 24.64 in 1988 (17.2%), to 24.66 in 1989 (0.6%), to 29.88 in 1990 (21.14%). A similar ascending movement is observed for the U.S as a whole (Gómez-Sorzano 2006).

Descending cycle 1991-2005 (a 15 year period) characterized by the World Trade Center Bombing, the Long Island train massacre, the enacting of the Crime Act, 9/11 2001 terrorist attacks in NYC, Operation Iraqui Freedom, and the beginning of the global war on terrorism.

In 1992 the U.S. and Colombian authorities kill Pablo Escobar, the index for NYC moves from 29.39 in 1991 to 26.81 in 1992 (-8.7%), this year additionally the FBI successfully prosecutes New York's Gambino family crime boss John Gotti on 13 charges or murder, gambling, racketeering, and tax fraud. Gotti had escaped three previous indictments since 1986, and had earned the nickname "Teflon Don".

In 1993 New York City experienced a second terrorist attack "the World Trade Center Bombing", the index with precision jumped, creating an estimated turning point date. Additionally the city experienced the tragic events of the Long Island train massacre. The index passed in 1992 from 26.81 to 27.26 in 1993 (1.69%).

The enacting of the Crime Act in 1994 appears as responsible for the fall of the index for that year, moving from 1993 to 1994, from 27.26 to 21.43 (-21.3%).

Finally, one more time, the index with amazing precision, same as happened in 1993, warned the occurrence of 9/11 2001 for the city; it created an estimated turning point date on 2001; the index moved from 2000 to 2001, from 3.84 to 3.90 (1.5%), and then decreased in 2002 to 3.09 (-20.5%). The post 9/11 attacks period is marked by permanent reductions from 2003 to 2005, from 3.39, to 2.53 to 2.15.

#### 4. Conclusions.

I have re-constructed the data series of per capita murder for New York City from 1797 to 2005, and used it for estimating the cyclical terrorist murder and attacks index for the city. The estimated index foretold with amazing precision the most important tragic events occurred in New York during the last two centuries: the shut down in power of 1965, the World Trade Center Bombing, and 9/11 terrorist attacks.

Immediate research must be done headed towards the construction of a model for forecasting terrorist attacks for New York City, and a model for permanent murder.

**Data Source:** FBI, Uniform Crime reports, Historical Statistics of the United States, Volume I, United States Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau.

#### Acknowledgements

I thank the organizers of the Stockholm Criminology Symposium 2007, Lina Nilsson, and the Jerry Lee Center of Criminology (Dr. Lawrence W. Sherman) for extending invitation to present this research. I additionally thank the Federal Bureau of Investigation (FBI), the Bureau of Economic Analysis (BEA), and the U.S. Census Bureau.

#### Appendix A. The Beveridge & Nelson decomposition of economic time series applied to decomposing New York City per capita homicides from 1797 to 2005.

I denote the observations of a stationary series of the logarithm of per capita homicides for New York City. by  $Lthom$  and its first differences by  $w_t$ . Following Beveridge & Nelson, BN for short, (1981, p.154), many economic times series require transformation to natural logs before the first differences exhibit stationarity, so the  $w_t$ 's, then are continuous rates of change.

$$W_t = Lt\ hom_t - Lt\ hom_{t-1} \quad (1)$$

If the  $w$ 's are stationary in the sense of fluctuating around a zero mean with stable autocovariance structure, then the decomposition theorem due to Wold (1938) implies that  $w_t$  maybe expressed as



$$W_t = \mu + \lambda_0 \varepsilon_t + \lambda_1 \varepsilon_{t-1} + \dots, \text{ where } \lambda_0 \equiv 1 \tag{2}$$

Where,  $\mu$  the  $\lambda$ 's are constants, and the  $\varepsilon$ 's are uncorrelated disturbances. According to BN, the expectation of  $Lt\text{hom}_{t+k}$  conditional on data for  $Lt\text{hom}$  through time  $t$  is denoted by  $\widehat{Lt\text{hom}}(k)$ , and is given by

$$\begin{aligned} \widehat{Lt\text{hom}}(k) &= E(Lt\text{hom}_{t+k} | \dots, Lt\text{hom}_{t-1}, Lt\text{hom}_t) \tag{3} \\ &= Lt\text{hom}_t + E(W_{t+1} + \dots + W_{t+k} | \dots, W_{t+1}, W_t) \\ &= Lt\text{hom} + \widehat{W}_t(1) + \dots + \widehat{W}_t(k) \end{aligned}$$

Since the  $z_t$ 's can be expressed as accumulations of the  $w_t$ 's. Now from (2) it is easy to see that the forecasts of  $w_{t+i}$  at time  $t$  are

$$\begin{aligned} \widehat{W}_t(i) &= \mu + \lambda_i \varepsilon_t + \lambda_{i+1} \varepsilon_{t-1} + \dots \tag{4} \\ &\quad \mu + \sum_{j=1}^{\infty} \lambda_j \varepsilon_{t+1-j}, \end{aligned}$$

Now substituting (4) in (3), and gathering terms in each  $\varepsilon_i$ , I get

$$\begin{aligned} \widehat{L\text{hom}}_t(k) &= L\text{hom}_t + \widehat{W}_t(i) \tag{5} \\ &= L\text{hom}_t + \left[ \mu + \sum_{j=1}^{\infty} \lambda_j \varepsilon_{t+1-j} \right] \\ &= k\mu + L\text{hom}_t + \left( \sum_1^k \lambda_i \right) \varepsilon_t + \left( \sum_2^{k+1} \lambda_i \right) \varepsilon_{t-1} + \dots \end{aligned}$$

And considering long forecasts, I approximately have

$$\widehat{L\text{hom}}_t(k) \cong k\mu + L\text{hom}_t + \left( \sum_1^{\infty} \lambda_i \right) \varepsilon_t + \left( \sum_2^{\infty} \lambda_i \right) \varepsilon_{t-1} + \dots \tag{6}$$

According to (6), it is clearly seen that the forecasts of homicide in period (k) is asymptotic to a linear function with slope equal to  $\mu$  (constant), and a level  $L\text{hom}_t$  (intercept or first value of the series).

Denoting this level by  $\overline{L\text{hom}}_t$  I have

$$\overline{L\text{hom}}_t = L\text{hom}_t + \left( \sum_1^{\infty} \lambda_i \right) \varepsilon_t + \left( \sum_2^{\infty} \lambda_i \right) \varepsilon_{t-1} + \dots \tag{7}$$

The unknown  $\mu$  and  $\lambda$ 's in Eq. (6) must be estimated. Beveridge and Nelson suggest and ARIMA procedure of order (p,1,q) with drift  $\mu$ .

$$W_t = \mu + \frac{(1 - \theta_1 L^1 - \dots - \theta_q L^q)}{(1 - \phi_1 L^1 - \dots - \phi_p L^p)} \varepsilon_t = \mu + \frac{\theta(L)}{\phi(L)} \varepsilon_t \quad (8)$$

Cuddington and Winters (1987, p.22, Eq. 7) realized that in the steady state, i.e., L=1, Eq. (9) converts to

$$\overline{L \text{ hom}_t} - \overline{L \text{ hom}_{t-1}} = \mu + \frac{(1 - \theta_1 - \dots - \theta_q)}{(1 - \phi_1 - \dots - \phi_p)} \varepsilon_t = \mu + \frac{\theta(1)}{\phi(1)} \varepsilon_t \quad (9)$$

The next step requires replacing the parameters of the ARIMA model (Table 3) and iterating Eq.(9) recursively, i.e., replace t by (t-1), and (t-1) by (t-2), etc, I get

$$W_t = \overline{L \text{ hom}_t} - \overline{L \text{ hom}_{t-1}} = \mu + \frac{\theta(1)}{\phi(1)} \varepsilon_t \quad (10)$$

$$W_{t-1} = \overline{L \text{ hom}_{t-1}} - \overline{L \text{ hom}_{t-2}} = \mu + \frac{\theta(1)}{\phi(1)} \varepsilon_{t-1}$$

:

$$W_1 = \overline{L \text{ hom}_1} - \overline{L \text{ hom}_0} = \mu + \frac{\theta(1)}{\phi(1)} \varepsilon_1 \quad (\text{this is the value for year 1826})$$

:

$$W_{180} = \overline{L \text{ hom}_{180}} - \overline{L \text{ hom}_0} = \mu + \frac{\theta(1)}{\phi(1)} \varepsilon_{180} \quad (\text{this is the value for year 2005})$$

Adding these equations I obtain  $w_1$  (the value for year 1826), and W180 (the value for year 2005), on the right hand side  $\mu$  is added "t" times, and the fraction following  $\mu$  is a constant multiplied by the sum of error terms. I obtain

$$\overline{L \text{ hom}_t} = \overline{L \text{ hom}_0} + \mu t + \frac{\theta(1)}{\phi(1)} \sum_{i=1}^t \varepsilon_i \quad (11)$$

This is, Newbold's (1990, 457, Eq.(6), which is a differential equations that solves after replacing the initial value for  $\overline{L \text{ hom}_0}$ , which is the logarithm of per capita murder in year 1826.

Cárdenas (1991), suggests that Eq.(11), should be changed when the ARIMA model includes autoregressive components. Since the ARIMA developed for New York City (Table 3), includes autoregressive, and moving average components, I formally show this now.

$$L \text{ hom}_t - L \text{ hom}_{t-1} = \mu + \sum_{i=1}^p \phi_i W_{t-i} + \sum_{j=1}^q \theta_j \varepsilon_{t-j} + \varepsilon_t \quad (12)$$

$$\Delta L \text{ hom}_t = W_t = L t \text{ hom}_t - L t \text{ hom}_{t-1}$$

$$L \text{ hom}_t - L \text{ hom}_{t-1} = \mu + \sum_{i=1}^p \phi_i \Delta L \text{ hom}_{t-i} + \sum_{j=1}^q \theta_j \varepsilon_{t-j} + \varepsilon_t$$

Bringing the moving average components to the LHS, I get

$$L \text{ hom}_t - L \text{ hom}_{t-1} - \left( \sum_{i=1}^p \phi_i \Delta L \text{ hom}_{t-i} \right) = \mu + \sum_{j=1}^q \theta_j \varepsilon_{t-j} + \varepsilon_t \quad (13)$$

Expanding summation terms

$$(1 - \phi_1 L^1 - \phi_2 L^2 - \dots - \phi_p L^p)(L \text{ hom}_t - L \text{ hom}_{t-1}) = \mu + (1 + \theta_1 L^1 + \dots + \theta_q L^q) \varepsilon_t \quad (14)$$

Rearranging Eq. (14) and including the ARIMA parameters from Table 3, I get.

$$L \text{ hom}_t - L \text{ hom}_{t-1} = \frac{0.0058}{1 + 0.21 + 0.11 - 0.56 - 0.11} + \left( \frac{1 - 0.78 - 0.22 - 0.29}{1 + 0.21 + 0.11 - 0.56 - 0.11} \right) \varepsilon_t \quad (15)$$

Now, after recursively replacing, t with (t-1), and (t-1) with (t-2), etc, and after adding together “t” times, I have

$$L \text{ hom}_t - L \text{ hom}_0 = \frac{0.0058 \cdot t}{1 + 0.21 + 0.11 - 0.56 - 0.11} + \left( \frac{1 - 0.78 - 0.22 - 0.29}{1 + 0.21 + 0.11 - 0.56 - 0.11} \right) \sum_{i=1}^t \varepsilon_i \quad (16)$$

And rearranging,

$$L \text{ hom}_t = L \text{ hom}_0 + \frac{0.0058 \cdot t}{1 + 0.21 + 0.11 - 0.56 - 0.11} + \left( \frac{1 - 0.78 - 0.22 - 0.29}{1 + 0.21 + 0.11 - 0.56 - 0.11} \right) \sum_{i=1}^t \varepsilon_i \quad (17)$$

In the steady state, when L=1, Eq. (17) yields the permanent component of the per capita murder for New York, the last step requires taking the exponential to the LHS of Eq. 17, getting the level for the permanent component. The cyclical component is finally obtained by the difference of the level of the observed per capita murder minus the level

of the permanent component. Both permanent and cyclical estimated components are shown in Fig.5, and presented in Appendix B.

**Appendix B : data table**

| year | Original Data |                   | BEVERIDGE - NELSON   |                     |
|------|---------------|-------------------|--|---------------------|
|      | Murder        | Murder per capita | Terrorist murder and attacks index<br>Cyclical - component | Permanent component |
| 1797 | 4             | 6.03              |  |                     |
| 1798 | 4             | 5.78              |  |                     |
| 1799 | 4             | 5.55              |  |                     |
| 1800 | 3             | 3.79              |  |                     |
| 1801 | 2             | 2.43              |  |                     |
| 1802 | 5             | 5.86              |  |                     |
| 1803 | 1             | 1.13              |  |                     |
| 1804 | 3             | 3.27              |  |                     |
| 1805 | 6             | 6.30              |  |                     |
| 1806 | 6             | 6.07              |  |                     |
| 1807 | 2             | 1.95              |  |                     |
| 1808 | 4             | 3.76              |  |                     |
| 1809 | 3             | 2.72              |  |                     |
| 1810 | 8             | 6.68              |  |                     |
| 1811 | 11            | 8.99              |  |                     |
| 1812 | 1             | 0.80              |  |                     |
| 1813 | 2             | 1.57              |  |                     |
| 1814 | 7             | 5.36              |  |                     |
| 1815 | 4             | 3.00              |  |                     |
| 1816 | 6             | 4.40              |  |                     |
| 1817 | 2             | 1.44              |  |                     |
| 1818 | 8             | 5.63              |  |                     |
| 1819 | 9             | 6.19              |  |                     |
| 1820 | 4             | 2.63              |  |                     |
| 1821 | 6             | 3.79              |  |                     |
| 1822 | 3             | 1.82              |  |                     |
| 1823 | 4             | 2.32              |  |                     |
| 1824 | 3             | 1.67              |  |                     |
| 1825 | 11            | 5.88              |  |                     |
| 1826 | 6             | 3.08              | 1.99   | 1.09                |
| 1827 | 8             | 3.94              | 2.86   | 1.07                |
| 1828 | 4             | 1.89              | 0.64   | 1.25                |
| 1829 | 3             | 1.36              | -0.27  | 1.63                |
| 1830 | 5             | 2.06              | 0.66   | 1.40                |
| 1831 | 8             | 3.16              | 1.72   | 1.44                |
| 1832 | 6             | 2.27              | 0.89   | 1.39                |
| 1833 | 11            | 4.00              | 2.82   | 1.18                |
| 1834 | 4             | 1.39              | -0.34  | 1.73                |
| 1835 | 12            | 4.00              | 2.79   | 1.22                |
| 1836 | 17            | 5.43              | 4.40   | 1.04                |
| 1837 | 12            | 3.68              | 2.39   | 1.28                |

|      |     |       |      |      |
|------|-----|-------|------|------|
| 1838 | 18  | 5.28  | 4.25 | 1.04 |
| 1839 | 17  | 4.78  | 3.67 | 1.11 |
| 1840 | 15  | 3.84  | 2.74 | 1.10 |
| 1841 | 11  | 2.67  | 1.29 | 1.38 |
| 1842 | 11  | 2.54  | 0.99 | 1.55 |
| 1843 | 14  | 3.07  | 1.48 | 1.59 |
| 1844 | 26  | 5.42  | 4.27 | 1.15 |
| 1845 | 14  | 2.77  | 1.22 | 1.56 |
| 1846 | 10  | 1.88  | 0.04 | 1.84 |
| 1847 | 16  | 2.86  | 1.12 | 1.74 |
| 1848 | 27  | 4.59  | 3.07 | 1.52 |
| 1849 | 34  | 5.49  | 4.24 | 1.25 |
| 1850 | 28  | 4.02  | 2.73 | 1.29 |
| 1851 | 28  | 3.84  | 2.47 | 1.37 |
| 1852 | 27  | 3.53  | 2.19 | 1.34 |
| 1853 | 57  | 7.12  | 5.91 | 1.21 |
| 1854 | 46  | 5.49  | 4.31 | 1.17 |
| 1855 | 39  | 4.44  | 3.19 | 1.25 |
| 1856 | 41  | 4.46  | 3.25 | 1.20 |
| 1857 | 94  | 9.75  | 8.83 | 0.92 |
| 1858 | 53  | 5.25  | 4.17 | 1.08 |
| 1859 | 71  | 6.71  | 5.52 | 1.19 |
| 1860 | 69  | 5.87  | 4.79 | 1.08 |
| 1861 | 66  | 5.50  | 4.27 | 1.23 |
| 1862 | 52  | 4.25  | 2.93 | 1.32 |
| 1863 | 127 | 10.16 | 9.26 | 0.90 |
| 1864 | 114 | 8.93  | 8.10 | 0.84 |
| 1865 | 67  | 5.14  | 4.01 | 1.13 |
| 1866 | 39  | 2.93  | 1.50 | 1.43 |
| 1867 | 59  | 4.35  | 2.94 | 1.40 |
| 1868 | 50  | 3.61  | 2.15 | 1.45 |
| 1869 | 73  | 5.16  | 4.06 | 1.10 |
| 1870 | 38  | 2.57  | 1.25 | 1.32 |
| 1871 | 55  | 3.64  | 2.37 | 1.26 |
| 1872 | 73  | 4.72  | 3.49 | 1.23 |
| 1873 | 65  | 4.10  | 2.86 | 1.25 |
| 1874 | 56  | 3.45  | 2.13 | 1.33 |
| 1875 | 59  | 3.56  | 2.28 | 1.28 |
| 1876 | 53  | 3.12  | 1.79 | 1.34 |
| 1877 | 53  | 3.05  | 1.66 | 1.39 |
| 1878 | 57  | 3.21  | 1.79 | 1.42 |
| 1879 | 46  | 2.53  | 1.07 | 1.46 |
| 1880 | 52  | 2.72  | 1.24 | 1.48 |
| 1881 | 61  | 3.11  | 1.56 | 1.55 |
| 1882 | 70  | 3.49  | 1.95 | 1.54 |
| 1883 | 56  | 2.72  | 1.12 | 1.60 |
| 1884 | 51  | 2.42  | 0.55 | 1.87 |
| 1885 | 54  | 2.50  | 0.78 | 1.72 |
| 1886 | 62  | 2.80  | 1.08 | 1.72 |
| 1887 | 68  | 3.00  | 1.23 | 1.77 |
| 1888 | 54  | 2.32  | 0.32 | 2.00 |
| 1889 | 65  | 2.73  | 0.91 | 1.82 |

|      |     |      |       |      |
|------|-----|------|-------|------|
| 1890 | 56  | 2.23 | 0.02  | 2.22 |
| 1891 | 49  | 1.90 | -0.49 | 2.39 |
| 1892 | 38  | 1.43 | -1.48 | 2.91 |
| 1893 | 44  | 1.61 | -1.33 | 2.94 |
| 1894 | 57  | 2.03 | -0.65 | 2.68 |
| 1895 | 68  | 2.35 | -0.09 | 2.44 |
| 1896 | 64  | 2.15 | -0.57 | 2.72 |
| 1897 | 61  | 2.00 | -0.99 | 2.99 |
| 1898 | 108 | 3.44 | 0.91  | 2.53 |
| 1899 | 130 | 4.02 | 1.67  | 2.35 |
| 1900 | 132 | 3.84 | 1.44  | 2.40 |
| 1901 | 101 | 2.85 | 0.27  | 2.58 |
| 1902 | 120 | 3.29 | 0.59  | 2.70 |
| 1903 | 123 | 3.28 | 0.45  | 2.83 |
| 1904 | 166 | 4.30 | 1.61  | 2.69 |
| 1905 | 161 | 4.05 | 1.44  | 2.61 |
| 1906 | 243 | 5.93 | 3.52  | 2.41 |
| 1907 | 273 | 6.47 | 4.26  | 2.21 |
| 1908 | 222 | 5.11 | 2.42  | 2.69 |
| 1909 | 177 | 3.96 | 0.80  | 3.16 |
| 1910 | 259 | 5.43 | 2.51  | 2.93 |
| 1911 | 253 | 5.23 | 2.47  | 2.76 |
| 1912 | 265 | 5.40 | 2.65  | 2.75 |
| 1913 | 280 | 5.62 | 3.01  | 2.61 |
| 1914 | 289 | 5.71 | 3.00  | 2.71 |
| 1915 | 227 | 4.42 | 1.20  | 3.22 |
| 1916 | 230 | 4.41 | 1.02  | 3.39 |
| 1917 | 209 | 3.95 | 0.39  | 3.56 |
| 1918 | 229 | 4.27 | 0.81  | 3.46 |
| 1919 | 270 | 4.96 | 1.84  | 3.11 |
| 1920 | 308 | 5.48 | 2.61  | 2.87 |
| 1921 | 284 | 4.96 | 1.86  | 3.10 |
| 1922 | 319 | 5.47 | 2.28  | 3.19 |
| 1923 | 290 | 4.88 | 1.44  | 3.44 |
| 1924 | 364 | 6.01 | 2.76  | 3.24 |
| 1925 | 328 | 5.31 | 1.97  | 3.34 |
| 1926 | 329 | 5.23 | 1.97  | 3.26 |
| 1927 | 340 | 5.30 | 1.99  | 3.31 |
| 1928 | 386 | 5.91 | 2.60  | 3.31 |
| 1929 | 410 | 6.16 | 2.83  | 3.33 |
| 1930 | 478 | 6.90 | 3.66  | 3.24 |
| 1931 | 562 | 8.06 | 4.92  | 3.13 |
| 1932 | 557 | 7.93 | 4.85  | 3.08 |
| 1933 | 513 | 7.26 | 4.06  | 3.20 |
| 1934 | 448 | 6.30 | 2.77  | 3.53 |
| 1935 | 431 | 6.02 | 2.33  | 3.69 |
| 1936 | 362 | 5.02 | 1.04  | 3.98 |
| 1937 | 354 | 4.88 | 0.60  | 4.28 |
| 1938 | 287 | 3.93 | -0.85 | 4.77 |
| 1939 | 295 | 4.01 | -0.99 | 5.00 |
| 1940 | 279 | 3.74 | -1.57 | 5.31 |
| 1941 | 271 | 3.62 | -2.01 | 5.63 |
| 1942 | 249 | 3.31 | -2.64 | 5.94 |
| 1943 | 208 | 2.75 | -4.07 | 6.82 |

|      |      |       |       |       |
|------|------|-------|-------|-------|
| 1944 | 216  | 2.84  | -4.20 | 7.04  |
| 1945 | 302  | 3.95  | -2.30 | 6.25  |
| 1946 | 350  | 4.55  | -1.22 | 5.77  |
| 1947 | 349  | 4.52  | -1.33 | 5.85  |
| 1948 | 323  | 4.16  | -2.13 | 6.28  |
| 1949 | 307  | 3.93  | -3.08 | 7.01  |
| 1950 | 294  | 3.73  | -4.17 | 7.90  |
| 1951 | 284  | 3.60  | -4.61 | 8.21  |
| 1952 | 318  | 4.04  | -4.05 | 8.09  |
| 1953 | 314  | 3.99  | -4.32 | 8.31  |
| 1954 | 342  | 4.36  | -4.24 | 8.60  |
| 1955 | 306  | 3.90  | -6.00 | 9.90  |
| 1956 | 315  | 4.02  | -7.00 | 11.02 |
| 1957 | 304  | 3.89  | -8.18 | 12.06 |
| 1958 | 354  | 4.53  | -7.25 | 11.78 |
| 1959 | 390  | 5.00  | -6.57 | 11.56 |
| 1960 | 390  | 5.01  | -6.78 | 11.80 |
| 1961 | 483  | 6.20  | -4.90 | 11.10 |
| 1962 | 508  | 6.51  | -4.94 | 11.46 |
| 1963 | 549  | 7.03  | -4.83 | 11.85 |
| 1964 | 537  | 6.86  | -5.71 | 12.57 |
| 1965 | 634  | 8.09  | -4.12 | 12.22 |
| 1966 | 654  | 8.34  | -3.96 | 12.30 |
| 1967 | 746  | 9.50  | -2.23 | 11.73 |
| 1968 | 1185 | 15.07 | 5.42  | 9.65  |
| 1969 | 1324 | 16.81 | 7.37  | 9.45  |
| 1970 | 1444 | 18.29 | 8.92  | 9.37  |
| 1971 | 1823 | 23.32 | 14.47 | 8.85  |
| 1972 | 2026 | 26.18 | 17.70 | 8.48  |
| 1973 | 2040 | 26.63 | 18.12 | 8.51  |
| 1974 | 1919 | 25.31 | 16.91 | 8.40  |
| 1975 | 1996 | 26.59 | 18.41 | 8.17  |
| 1976 | 1969 | 26.49 | 18.13 | 8.36  |
| 1977 | 1919 | 26.08 | 17.64 | 8.44  |
| 1978 | 1820 | 24.99 | 16.23 | 8.76  |
| 1979 | 2092 | 29.01 | 20.73 | 8.28  |
| 1980 | 2228 | 31.51 | 23.64 | 7.87  |
| 1981 | 2166 | 30.53 | 22.91 | 7.63  |
| 1982 | 2013 | 28.29 | 20.55 | 7.73  |
| 1983 | 1958 | 27.43 | 19.68 | 7.75  |
| 1984 | 1786 | 24.94 | 17.11 | 7.83  |
| 1985 | 1683 | 23.43 | 15.49 | 7.94  |
| 1986 | 1907 | 26.46 | 19.05 | 7.41  |
| 1987 | 2016 | 27.88 | 21.03 | 6.86  |
| 1988 | 2244 | 30.94 | 24.65 | 6.29  |
| 1989 | 2246 | 30.87 | 24.67 | 6.20  |
| 1990 | 2605 | 35.57 | 29.88 | 5.69  |
| 1991 | 2571 | 35.00 | 29.39 | 5.61  |
| 1992 | 2397 | 32.53 | 26.81 | 5.71  |
| 1993 | 2420 | 32.74 | 27.27 | 5.47  |
| 1994 | 2016 | 27.18 | 21.44 | 5.75  |
| 1995 | 1550 | 20.83 | 14.39 | 6.44  |
| 1996 | 1353 | 18.13 | 11.12 | 7.01  |
| 1997 | 1093 | 14.60 | 6.78  | 7.82  |

|      |     |       |      |      |
|------|-----|-------|------|------|
| 1998 | 924 | 12.30 | 3.53 | 8.78 |
| 1999 | 903 | 11.98 | 2.99 | 8.99 |
| 2000 | 952 | 12.60 | 3.84 | 8.75 |
| 2001 | 960 | 12.66 | 3.90 | 8.76 |
| 2002 | 909 | 11.95 | 3.10 | 8.85 |
| 2003 | 934 | 12.24 | 3.39 | 8.85 |
| 2004 | 889 | 11.61 | 2.53 | 9.08 |
| 2005 | 874 | 11.38 | 2.15 | 9.23 |



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