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MULTIPLE DATA STREAM ANALYSIS AND SHORT TERM  
FORECASTING

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| <p>The research reported is principally concerned with the development of techniques for the analysis and interpretation of multiple streams of event data and techniques for forecasting by the use of quantitative historical analogies. The work builds on prior research on the coding of event data and the development of quantitative indicators for defense analysis.</p> <p>The multiple data stream analysis is based on event data coded from the daily <u>New York Times</u> and <u>The Times</u> of London from mid-1971 to mid-1974. The analysis illustrates the similarities and differences in the international interests, attention and viewpoints of the US and UK as reflected in these public media sources.</p> <p>A short term forecasting technique is developed based on historical patterns derived from univariate time series analysis. The use of these patterns and their subsequent outcomes as analogues for forecasting the outcomes of current situations is argued and illustrated. In addition, a research design for multivariate analysis is described.</p> |                                                                             |                                    |

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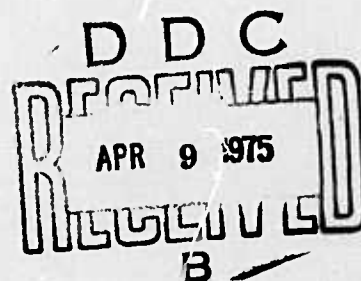
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## INTERIM TECHNICAL REPORT

April, 1975

### MULTIPLE DATA STREAM ANALYSIS AND SHORT TERM FORECASTING

Sponsored by:  
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## PREFACE

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This report describes the status of research being performed for the Advanced Research Projects Agency Human Resources Research Office on development of techniques of event analysis and short term forecasting and their application within the national security community. The report describes accomplishments for the period 15 September 1974 through 15 March 1975.

The work reported herein is principally concerned with the development and analysis of multiple data stream techniques and techniques of forecasting by quantitative analogies. The work builds on prior research devoted to the coding and collection of event data and the development of quantitative indicators for defense analysis. The continuing objective of all research has been to develop event analysis to the point where it can be useful to the national security community as a means for systematically recording, analyzing and forecasting significant international phenomena.

The work should be of interest to all agencies involved with the management of foreign affairs and national security programs.

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## STUDY PARTICIPANTS

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The study team participants include:

Anne Gilbar  
Jeffrey Krend  
James Moore  
Vivian Moore  
Theodore Rubin, Principal Investigator

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## SUMMARY

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### PROJECT OBJECTIVES

The objectives of the research reported here are the development of new techniques for event data analysis <sup>1</sup> and for short term forecasting, plus demonstration of the utility of such techniques as they might be applied to problems of national security concern.

The new technique for event data analysis involves the treatment of public news media sources of different national origins as reflecting the perceptions, interests and viewpoints of the originating countries. We term this approach multiple data stream analysis. It is contended that similarities and differences present in such media sources are indicative of official national similarities and differences, and therefore, can provide insight into present and prospective international behavior patterns. Specifically, it is assumed throughout that countries act on the basis of their own views rather than on the basis of any other reality. Therefore, we are well advised to identify the views of others as a means of anticipating the nature of their ongoing international participation. While the use of public media views as surrogates for official views must always be with caution, it is the purpose of this research to illustrate the kinds of unique information such an approach may provide on selected matters of national security concern.

The new technique for short term forecasting is based on the development of quantitative historical patterns to permit the

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<sup>1</sup> Event data analysis refers to the quantitative assessment of international behavior as expressed in terms of the actions, or events, that are recorded as occurring between and within countries.

forecast outcome of a current situation to be a function of the outcome of its most similar past analogue. This form of forecasting is often used subjectively. In quantitative form, however, history constitutes large samples, permitting forecast outcomes to be represented probabilistically. The implications of this approach to the DoD and intelligence communities lie in the potential ability to classify a current situation according to the past patterns it most closely resembles and to supplement that classification with probabilistic estimates of the likely outcome in prospect.

#### MULTIPLE DATA STREAM ANALYSIS (MDS)

The MDS research reported here is based on the use of two public media sources, the daily New York Times (NYT) and The Times of London (TOL). These sources were selected because they had previously been subjected to event data coding, thus requiring no further data development for project purposes. Data were available for both sources for the 36 month period July 1971 through June 1974. A series of comparative analyses were performed variously employing frequency distributions of the raw event data, summary indicators which depict the friendliness to hostility of international behavior,<sup>1</sup> and English language abstracts of the events which are prepared in the process of event coding. Comparative analyses were performed to answer a series of research questions. The findings illustrate the inferences regarding similarities and differences in national interests, attention, and points of view which may be derived from multiple data streams.

The research questions are stated below, each followed by a summary of findings.<sup>2</sup> The findings are couched in terms of US

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<sup>1</sup> See Appendix B for the definition and measurement of these summary indicators.

<sup>2</sup> Detailed findings appear in "MDS Findings", pp. 6-51.

and UK international behavior. It should be emphasized, however, that the findings are in fact US and UK behavior as deduced from reports in NYT and TOL.

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What were the US and UK views of overall international affairs between mid-1971 and mid-1974?

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The US viewed this period as one of increasing international activity and declining animosity, apparently because of the emphasis on reconciliation with China, detente with the USSR, and extrication of the US from combat in South East Asia. The UK did not consider this period atypical in activity or hostility, until the Yom Kippur War and Oil Embargo. Following these episodes the UK view of international affairs was substantially more negative than that of the US.

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What regions, countries and country pairs drew the interest and attention of US and UK during this period?

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Geographic considerations appeared to dominate differing regional distributions of US and UK actions toward the world. Europe was the paramount target of UK while Asia was paramount to the US. However, strategic and historical considerations appeared to be present as well. For example, within Europe, the US directed about twice as much attention to the USSR as did the UK. Conversely, within Asia the UK directed about twice as much attention to its former colonies as did the US. Overall, the priorities of interests of the two countries as expressed by their actions during this period appeared to be quite different.

On the other hand, with regard to following the actions of other countries and interactions between other pairs of countries, the US and UK manifested a generally similar pattern of attention. Both countries concentrated attention on and between countries which are major world powers and/or were directly or indirectly involved in conflict situations.

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How did US and UK view the friendliness to hostility of actions flowing from each other to third countries and from third countries toward each other?

---

In this analysis, the principal acting country, either US or UK, was assumed to represent its own actions accurately. The other principal, as an "observer", was assumed to "misinterpret" if its reports did not reflect a degree of friendliness or hostility similar to that of the actor. Similarly, as recipients of the actions of third countries, the principals' views were assumed accurate and the observers' either similar or a misinterpretation.

The findings indicated correspondence between the views of US and UK in 79% of all cases examined. Interestingly, however, the misinterpretation that existed in the remaining cases tended to be large (17% of the cases) rather than small (6% of the cases). The implication is that different interpretations form the foundations for subsequent actions between the principal countries and from them toward others. To the extent that their views differ, so may their future behavior--even if they are otherwise similarly disposed toward the issues involved.

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What were the US and UK views of the friendliness to hostility of their own interaction during this period?

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In this analysis, the Policy Style measure<sup>1</sup> was employed to indicate the quality of actions initiated and received between the principal countries, US and UK, over the 36 month time period. This case is unique in that US and UK are the countries of origin of the two media sources employed. It was therefore treated in greater detail than any other, being considered illustrative of the kinds of analyses possible were MDS techniques extended to additional sources representing other countries.

The initial finding was that both US and UK viewed their Policy Styles toward one another similarly over the 36 months. However, during portions of the overall period a counter-intuitive lead-lag relationship was evident, i.e., the target country seemingly anticipated the actor country's Policy Style toward itself. In examining this in detail, it was found that these temporary lead lag phenomena were related to the differing presence of and emphasis given to specific subjects in the interaction of the pair, as viewed by each party. Since it was also found that the Style, or quality of interaction, on each subject was similarly viewed by both parties, it was evident that different subject emphasis was the basis of the leads and lags. Further, it was during periods when attention to subjects equalized that the lead-lag phenomenon disappeared. Some further evidence was developed showing that the Style of the country emphasizing higher level bureaucratic actions (policy initiating actions) on a subject leads the Style of the country emphasizing lower level bureaucratic actions (policy implementing actions) on the subject.

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<sup>1</sup>See Appendix B.

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<sup>1</sup> See Appendix B.

The implications of these MDS findings are that lead-lag phenomena in the quality of a relationship are subject and, perhaps, bureaucracy related, and tend to be transitory. This phenomenon and its explanation, however, does provide guidance as to how MDS analysis between principal countries might be used predictively in the short term.

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How did the US and UK view the friendliness to hostility between other pairs of countries during this period?

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With respect to the interaction of other pairs of countries (e.g., USSR and China), both US and UK are observers. We wish to ascertain how similar or different are US and UK views of such pairs in order to compare their current assessment and to anticipate their future behavior toward situations evolving between other countries.

US and UK views of Relations between eight country pairs over time were employed as cases in this analysis. The country pairs selected were those manifesting armed conflict during the period under examination and/or having an ongoing history of hostility. For the entire time period, for six of the eight cases, close correspondence was found between the inferred US and UK assessments, and lack of correspondence was not unreasonably large for the other two cases.

During various segments of the total time period, however, there were seemingly different assessments in three of the eight cases. As in the case of the US-UK analysis, it is in identifying these short term incongruencies where the MDS approach may prove most useful, if our assumption is correct that a country's future actions are based on the reality of its own current views. For example, prior to the Yom Kippur War, UK viewed Relations

between Israel and Egypt as improving while the US viewed their Relations as declining steadily. Apart from the fact that in this instance, the US view was a better predictor of what followed, the UK apparently viewed the evolving situation as less urgent. Under such circumstances would UK act in concert with the US to avert or manage a crisis it did not view as imminent? Incongruence in views, therefore, signal the need and provide the opportunity to review a situation in detail prior to rather than after the fact of crises.

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What were the alignments between US and UK toward other countries during this time period?

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In this analysis, the Alignment of US and UK toward another country was measured as the difference between their Policy Styles toward that country. Alignment is most properly measured by the differing quality of actions each country reports it initiated toward another country. We term this the signalled Alignment. Additionally there are the US and UK views of Alignment which are based on their own reported actions and their observations of actions initiated by the other. The signalled Alignment can be considered to be truer and can be contrasted with separate US and UK views.

Because of the generally similar international positions of US and UK, their signalled Alignments in 75% of the 21 cases examined tended to be close to very close. Of greater importance, however, are cases where the US and UK views of Alignment differ even though the signalled Alignment is close. For example, the US viewed UK behavior toward France as much more friendly than its own, while the UK view was just the opposite. This type of finding further emphasizes a previously stated implication. Where views differ, so may the subsequent behavior of the prin-

cipals involved, if they act in accord with their own reality. Through MDS techniques, monitoring for incongruencies between views can help identify possible areas of future policy differences which may be detrimental to US national security interests.

#### SHORT TERM FORECASTING RESEARCH

In previous ARPA supported research, preliminary progress was achieved in adapting the subjective technique of forecasting by historical analogy into quantitative terms. Previous results showed that five patterns could be deduced from time series histories of the Relations (R) and Policy Style (S) measures for large samples of country pairs, and that each of these patterns was associated with a subsequent two year change ( $\Delta R$  or  $\Delta S$ ) which was significantly different from the overall distributions of changes across the entire samples.

The  $\Delta R$  and  $\Delta S$  distributions were proposed as probability distributions useful for forecasting future two-year changes in R and S for cases currently conforming to any of the five patterns. However, it was proposed that these distributions be used as forecasts only in the absence of more specific information, or as a supplement to such information, just as the subjective technique from which it is adapted is used. The present research is intended to replicate and extend earlier findings, to assess the validity of forecasts based on the quantitative analogies, and to demonstrate utility. Research questions which have been addressed thus far are stated below along with a summary of the findings related to each.<sup>1</sup>

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<sup>1</sup>Detailed findings appear in "Findings", pp. 55-71.

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How representative was the distribution of changes in Relations ( $\Delta R$ ) in the original research sample?

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The original experimental case sample (Sample 1) was not randomly selected, but consisted only of pairs of individual countries and, for those pairs, was limited to  $\Delta R$  values for one two-year time period. Two additional samples were, therefore, prepared. Sample 2 consisted of all two year  $\Delta R$  values for the original sample of 74 country pairs. Sample 3 consisted of 69 pairs including country groups (e.g., Relations between USSR and NATO) and issues within country pairs (e.g., Military Relations between USSR and China), but like Sample 1,  $\Delta R$  values were limited to one time period.

It was found that the distributions of  $\Delta R$  for Samples 1 and 2 were virtually identical. This suggests that the original (Sample 1)  $\Delta R$  distribution is representative of the universe of  $\Delta R$  distributions across all time periods for country pairs. Sample 3, however, differed somewhat from Samples 1 and 2, suggesting that  $\Delta R$  distributions associated with Relations for pairs other than country pairs may reflect some systematic difference, and that use of the original set of forecasting distributions for pairs of these types may not be appropriate.

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What  $\Delta R$  distributions are associated with the five historical patterns for the pairs in Sample 3?

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The purpose of this analysis was to derive a set of  $\Delta R$  forecasting distributions for cases including country group pairs and issue pairs (Sample 3) and to determine how these distributions differed from the original.

The resulting  $\Delta R$  distributions by historical pattern were similar in some respects and different in others from those derived from Sample 1. The implication is that it may be preferable to limit the use of R distributions in forecasting to pairs equivalent to those from which the distributions were originally derived.

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How can the direction of  $\Delta R$  as well as the magnitude of  $\Delta R$  be forecast?

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Previous experiments focused only on the magnitude of  $\Delta R$  because of sample size limitations. Therefore, the forecasting distributions derived are only for the magnitude of change, not its direction.

In this analysis, the most current value of R in the time series (base R) was assumed to be related to the subsequent direction of change in R, primarily because the R scale is constrained, i.e., ranges only from +1.0 to -1.0. First, the distribution of base R was compared between Samples 1 and 2 and was found to be almost identical. That being the case, the larger Sample 2 was employed to examine the relationship of base R and the combined direction and magnitude distributions of  $\Delta R$ .

The expected relationships were found. First, the more extreme the base R value the greater the likelihood of change away from the extreme. Second, the greater the magnitude of  $\Delta R$  the more pronounced was this effect. Based on these findings, odds on the direction of change as a function of base R and  $\Delta R$  were constructed and a means proposed for producing a probabilistic forecasting distribution reflecting both magnitude and direction.

Forthcoming validation experiments will attempt to determine the degree, if any, to which forecasting based on quantitatively derived analogies is superior to forecasting by chance alone.

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## OBJECTIVES AND CURRENT STATEMENT OF WORK

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The objectives of this research are the development and evaluation of new methods of event data analysis and new techniques for short term forecasting, plus the assessment of the utility of such new techniques as they might be applied to problems of national security interest.

The new methods of event data analysis involve the treatment of public news media of different national origins as reflecting the official perceptions, interests and viewpoints of the originating countries. In other words, for example, we treat The Times of London as a surrogate "spokesman" for the UK, as we might treat Pravda as a surrogate "spokesman" for the USSR. The implications of this approach for the DoD and intelligence communities may be of considerable significance. First, the sources themselves are freely available. Second, the similarities and differences they reflect may shed additional light on such matters of national security interest as:

1. How countries perceive the behavior of other countries toward themselves, toward other countries of vital interest to them, and toward evolving and continuing crises,
2. How two countries are aligned in their behavior toward third countries and regions, and
3. Where the vital interests of countries tend to overlap and where they are separate, and so on.

While use of public media sources as surrogates for official opinion and policy must always be with caution, it is the purpose of this research to assume that some degree of sub-

stitutability is reasonable, and to illustrate the kinds of unique information such an approach may provide.

The new techniques for short term forecasting associate the future of a current situation with the outcomes of similar past situations represented quantitatively. It is a form of forecasting by analogy, a technique often used subjectively. In quantitative form, however, past situations constitute a large sample and, as a result, past outcomes may be represented probabilistically. This technique seems to fill a gap in quantitative forecasting techniques between existing extrapolative techniques, which have generally been found wanting in terms of their ability to predict change, and the availability of theoretically based, empirically tested predictive models of international behavior, which are in various stages of development. The implications of this approach for the DoD and intelligence communities lie in the potential ability to, in effect, "classify" a current situation according to the past patterns it most closely resembles, and to supplement that classification with a set of probabilistic estimates of the likely degree of change in prospect.

The tasks involved in the project Statement of Work may be summarized as follows:

A. Multiple Data Stream Research

Task A-1. CACI will perform comparative analyses based on both the New York Times and The Times of London event data sources as follows:

- a. A literature survey will be performed to assess previous research in the area of inter-source comparisons,
- b. A comparative source analysis will be performed of interactions between the USA and the United Kingdom,
- c. Comparative source analyses will be performed of interaction between other pairs of international actors, and

- d. Comparative source analyses will be performed of interaction between the USA and the United Kingdom and other international actors.

Task A-2. Based on the results of Task A-1, the principal similarities and differences between the sources in both scope of coverage and point of view, will be identified and evaluated.

Task A-3. The potential utility of multiple data stream analysis as a technique for providing unique information to DoD from available foreign sources will be assessed.

#### B. Short Term Forecasting Research

Task B-1. CACI will undertake further development of univariate time series analysis as a technique for short term forecasting based on historical analogies as follows:

- a. CACI will expand the scope of development by experimenting with alternative samples, time periods and indicators.
- b. CACI will attempt to validate forecasting patterns by comparing forecasts with observed values for the 1973-1974 period, and by comparing forecast probability distributions with distributions derived randomly.
- c. CACI will assess the utility of the forecasting technique based on the preparation and interpretation of sample forecasts for one or more regions.

Task B-2. CACI will examine multivariate cross-sectional analysis as a technique for establishing historical precedents for forecasting short term crises involving the use of military force. Forecasts based on the technique will be prepared and the utility of the technique will be assessed.

#### C. Dissemination of Results

Task C-1. Results of the study will be reported in an interim technical report and in a final technical report.

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## STATUS OF MDS RESEARCH

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The research findings reported herein are based on selected comparative analyses of international affairs information reported in two public media sources, the daily New York Times (NYT) and The Times of London (TOL). These sources are similar in that both are leading, globally oriented newspapers produced within countries, the US and the UK, respectively, which have long traditions of press freedom. As such, news reported in the two sources may be assumed to overlap only partially with official governmental views of international affairs. Nevertheless, in the analyses it will be assumed that these media are surrogates for officialdom in order to suggest how such analyses might be interpreted were they based on news sources emanating from countries which exercise control over media reporting, i.e., countries in which the media serve the role of governmental spokesman. The thrust of the analyses will be to determine the similarities and differences between the US and UK, as inferred from NYT and TOL, respectively, in their geographic interest and attention, and in their views of international relationships, including their own.

This approach to the use of and comparison of multiple sources of event data differs substantially from prior analyses. A survey of representative research reports on intersource event data comparison, which appears herein as Appendix A, shows an emphasis on other objectives. Specifically, use of multiple data sources has been previously viewed primarily as a means to:

1. increase the comprehensiveness of reporting coverage and enlarge the total data base available for analysis,
2. reduce bias in interpretation by integrating different points of view, and

3. provide a means to validate events through multiple observations.

All these objectives are directed primarily toward a determination of the "true" international situation.

On the other hand, the objective pursued in the current research is toward exploiting rather than reducing differences which exist among sources. The intent is to consider each source as representing unique interests and points of view relative to international affairs, to examine source similarities and differences, and in so doing, to attempt to infer the commonalities and oppositions that are implied between the countries that the sources represent. It is assumed that for many purposes it may be more important to be aware of the similarities and differences between the views of countries than to be aware of the "true" state of foreign affairs.

All of the international event data employed in the analyses were previously coded from NYT and TOL in the standard WEIS<sup>\*</sup> format. The WEIS coding elements include the actor country and the target country for each event (which is itself coded into one of 63 potential event categories) and the date the event was reported as taking place. For the analysis of interaction directly between the US and the UK additional coding was performed on both sources to identify the principal subjects (or issues) of interaction. All analyses were performed variously using the raw event data, aggregate indicators devel-

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\* WEIS is the acronym for World Event Interaction Survey, a program conducted under ARPA sponsorship at the University of Southern California and directed by Professor Charles McClelland. Event coding of NYT which originated at USC has been conducted by CACI, Inc. since 1972. Event coding of TOL continues by Prof. McClelland to whom we are indebted for making the TOL data available for our use.

oped from the event data<sup>\*</sup>, and the English language abstracts of the events which are prepared as a matter of course as part of the event coding process.

The time span of analysis is 36 months, from July 1, 1971 through June 30, 1974. While for some purposes a longer time span might have been preferable this particular period represents the maximum period for which data were available to the project from both sources. For this 36 month period the total event data yield from NYT was almost exactly double that of TOL (30,925 events vs. 15,279 events, respectively).

The findings of the MDS analyses are organized below in terms of a series of general questions posed to the data. Emphasis in the findings is on the similarities and differences between US and UK views presented in or inferred from the two sources. The assumption throughout is that countries tend to act in terms of their own views rather than in terms of any other reality. Therefore, similarities and differences in current viewpoints are likely to precede similarities and differences in subsequent courses of action.

#### MDS FINDINGS

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What are the trends in the overall character of international affairs between mid-1971 and mid-1974 as conveyed by NYT and TOL?

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Most questions posed to the data will be analysed in terms of both event frequencies, which represent magnitudes of reported

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\* For a summary description of event data and the aggregate indicators employed in MDS analysis see International Affairs Indicators for Defense Decision-Making, Theodore J. Rubin, CACI, Inc. report number RM305, January 1973. Also, for convenience a brief description of selected indicators appears as Appendix B to this report.

interaction, and event frequency ratios designed to represent the friendliness to hostility of interaction.

Table 1 displays the total worldwide event frequency reported in each of the two sources by six month intervals during the available three year time span. The number of TOL events in each period is relatively constant but NYT event totals show a continuous increase except for the last six month period. The ratios of these frequencies in Table 1 show the variation from period to period of NYT event reporting relative to that of TOL. Key international episodes of importance to both countries appear to the right of the table.

Two possible and related explanations of the increasing trend in NYT worldwide coverage are:

1. The emphasis placed by the Nixon administration on foreign affairs and peacemaking, highlighted by reconciliation with China, and
2. The managed winding-down of US military activities in S.E. Asia, coupled with close scrutiny by the press of U.S. involvement there.

Since neither of these factors would necessarily be expected to be as heavily reported in the UK, TOL event coverage might well be expected to be less changeable than NYT over the period under examination.

Table 2 tends to lend substance to these explanations. Here, worldwide values for the Relations indicator<sup>\*</sup> are displayed for the same time intervals as in Table 1. Note that there is an improving trend in worldwide Relations as derived from NYT reports, beginning in 1972. (The Relations index is increasingly less negative.) On the other hand, worldwide Relations, as derived from TOL is virtually constant, except for the second half of 1973 when the Yom Kippur War took place and the Arab Oil Embargo began. The latter episode had much more immediate

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\* See Appendix B.

TABLE 1.  
Worldwide Event Frequency, mid-1971 to mid-1974

| Time Interval    | Total Events Reported, Worldwide |            |                            | Key International Episodes                     |
|------------------|----------------------------------|------------|----------------------------|------------------------------------------------|
|                  | <u>NYT</u>                       | <u>TOL</u> | <u>NYT</u> /<br><u>TOL</u> |                                                |
| 1971, 2nd half   | 3783                             | 2709       | 1.4                        | UK joins Common Market<br>India-Pakistan War   |
| 1972, 1st half   | 4274                             | 2786       | 1.5                        | Nixon visits Peking & Moscow                   |
| 1972, 2nd half   | 5466                             | 2329       | 2.3                        |                                                |
| 1973, 1st half   | 5939                             | 2564       | 2.3                        | Truce in S.E. Asia<br>E.German-W.German Treaty |
| 1973, 2nd half   | 7393                             | 2729       | 2.7                        | Yom Kippur War<br>Arab Oil Embargo             |
| 1974, 1st half   | 4070                             | 2162       | 1.9                        |                                                |
| Total, 36 months | 30,925                           | 15,279     | 2.0                        |                                                |

TABLE 2.  
Worldwide Relations, mid-1971 to mid-1974

| Time Interval    | Worldwide Relations |            |                                   | Key International Episodes                     |
|------------------|---------------------|------------|-----------------------------------|------------------------------------------------|
|                  | <u>NYT</u>          | <u>TOL</u> | <u>NYT</u><br>minus<br><u>TOL</u> |                                                |
| 1971, 2nd half   | -.34                | -.24       | .10                               | UK joins Common Market<br>India-Pakistan War   |
| 1972, 1st half   | -.41                | -.29       | .12                               | Nixon visits Peking & Moscow                   |
| 1972, 2nd half   | -.34                | -.27       | .07                               |                                                |
| 1973, 1st half   | -.25                | -.25       | 0                                 | Truce in S.E. Asia<br>E.German-W.German Treaty |
| 1973, 2nd half   | -.20                | -.40       | -.20                              | Yom Kippur War<br>Arab Oil Embargo             |
| 1974, 1st half   | -.08                | -.27       | -.19                              |                                                |
| Total, 36 months | -.27                | -.29       | -.02                              |                                                |

and traumatic effects on UK and its foreign relations than on the US.

The difference between worldwide Relations values also appears in the table. This index shows the relatively greater negative perspective of TOL during and subsequent to events during the last half of 1973.

The overall implications of these two displays are that from the US point of view (NYT):

- The period under examination was one where expanded attention to and activity in "peacemaking" in foreign affairs resulted in a continuing reduction in worldwide hostility--notwithstanding the occurrence of war in the Middle East.

From the UK point of view (TOL):

- Nothing sufficiently atypical characterized this period or resulted in more than marginal variation in attention to foreign affairs or in the quality of foreign affairs, except the impact of the Yom Kippur War and the associated oil embargo.

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What are the foci of US and UK geographic attention and interest as conveyed by NYT and TOL?

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The question of national interest or attention can best be addressed in terms of the geographic distribution of a country's worldwide actions relative to its own location. Both the US and UK are acknowledged world powers, or at least in the case of UK, internationalistic in interest. Table 3 displays the distributions of actions of both countries, as reported by their own media, toward the world divided into four major geographic aggregates plus organizations (such as NATO, UNO, etc.). The table clearly shows the major differences in attention of the two countries. During the period of interest, the UK directed about two-thirds of its actions toward Europe and Africa while the US directed about two-thirds of its actions toward Asia and various international organizations. These differences are apparently dominated by geographic factors, including the location of UNO in New York.

Table 4 provides a more detailed view of the same information. At this greater level of target detail, it is seen that predominance is not geographically based alone but is also a function of strategic and historical factors. For example, in Europe which is the predominant interest of UK, the US nevertheless directs more than twice as much of its total attention to the USSR than does UK. On the other hand, in Asia which is the predominant interest of the US, the UK directs about twice as much attention to its former colonies than does the US. Only with respect to China and the Middle East is the relative attention of the US and UK about the same.

The US and UK might be considered more closely akin in viewpoint than most countries because of their common heritage and culture and similar economic and political philosophies.

TABLE 3.  
Aggregate Distribution of US and UK Actions,  
mid-1971 to mid-1974

| TARGET                       | Percent of total actions |                   |
|------------------------------|--------------------------|-------------------|
|                              | US, in <u>NYT</u>        | UK, in <u>TOL</u> |
| Western Hemisphere, incl. US | 4.6                      | 6.5               |
| Europe, incl. UK             | 18.3                     | 48.5 *            |
| Africa                       | 9.5                      | 18.6 *            |
| Asia                         | 40.1 *                   | 13.1              |
| Organizations                | 27.4 *                   | 13.1              |
| TOTAL                        | 99.9                     | 99.8              |

\* predominant in attention

TABLE 4  
Distribution of US and UK Actions to 15 Target Groups,  
mid-1971 to mid-1974

| TARGET                  | Percent of total actions |                   |
|-------------------------|--------------------------|-------------------|
|                         | US, in <u>NYT</u>        | UK, in <u>TOL</u> |
| Western Hemisphere      |                          |                   |
| US                      | ---                      | 4.4               |
| North & Central America | 2.7*                     | 1.2               |
| South America           | 1.9*                     | .9                |
| Europe                  |                          |                   |
| UK                      | .9                       | ---               |
| USSR                    | 8.5*                     | 3.6               |
| Other Europe            | 8.9                      | 44.9*             |
| Africa                  |                          |                   |
| Middle East             | 7.6                      | 7.2               |
| North Africa            | .9                       | 1.7*              |
| All other Africa        | 1.0                      | 9.7*              |
| Asia                    |                          |                   |
| China                   | 2.0                      | 2.1               |
| Japan                   | 2.4*                     | .9                |
| India, Pakistan         | 2.2                      | 4.1*              |
| S.E. Asia               | 30.6*                    | .9                |
| All other Asia          | 2.9                      | 5.1*              |
| Organizations           | 27.4*                    | 13.1              |
| TOTAL                   | 99.9                     | 99.8              |

\* predominant in attention

But in foreign affairs their interests appear to be dominated by geography plus historical and strategic factors. The implications of these two displays are that from the US point of view:

- S.E. Asia, the USSR and the Middle East were paramount foci of its interest during the period in question, along with participation in international organizations.

From the UK point of view:

- Europe transcends all other interests in importance, with moderate attention paid to the Middle East and ex-Colonial Africa as well.

These distributions define very different sets of prioritized interests as between the US and UK.

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What are the comparative interests of US and UK in other actor countries as conveyed by NYT and TOL?

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Another aspect of the attention and interest of two countries, besides the distributions of their own actions, is their attention to the actions of other countries. Table 5 presents information which permits comparison between the US and UK in this aspect of international attention during the 36 months under examination.

Table 5 was constructed by listing the 25 highest ranking countries\* in NYT relative to number of actions they reportedly initiated. The percent of total NYT reported actions attributed to each actor is also shown. In the last two columns of Table 5 the corresponding ranks and percentages for each country in TOL are shown where the country is also among the leading 25 actors in TOL. Those countries in TOL's leading 25 which are not common to the NYT list are appended at the bottom of the table.

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\* Abbreviations for country names are employed in this and subsequent tables. For a list of all countries and corresponding abbreviations see Appendix C.

TABLE 5.  
Leading Actor Countries as Viewed by US and UK,  
mid-1971 to mid-1974

| Actor Country | NYT  |                             | TOL  |                             |
|---------------|------|-----------------------------|------|-----------------------------|
|               | Rank | % of total actions reported | Rank | % of total actions reported |
| USA           | 1    | 19.8                        | 1    | 10.1                        |
| VTN           | 2    | 9.1                         | 5    | 5.4                         |
| VTS           | 3    | 6.1                         | 6    | 4.6                         |
| USR           | 4    | 5.8                         | 3    | 5.6                         |
| ISR           | 5    | 5.1                         | 4    | 5.5                         |
| UAR           | 6    | 3.3                         | 7    | 3.8                         |
| CPR           | 7    | 2.7                         | 9    | 3.1                         |
| UNK           | 8    | 2.0                         | 2    | 7.6                         |
| CAM           | 9    | 2.0                         | 18   | 1.1                         |
| IND           | 10   | 2.0                         | 10   | 3.0                         |
| JAP           | 11   | 1.9                         | 17   | 1.2                         |
| FRN           | 12   | 1.8                         | 11   | 2.9                         |
| PAK           | 13   | 1.6                         | 12   | 2.3                         |
| GMW           | 14   | 1.6                         | 8    | 3.2                         |
| SYR           | 15   | 1.6                         | 13   | 2.1                         |
| CAN           | 16   | 1.1                         |      |                             |
| LAO           | 17   | 1.0                         |      |                             |
| LEB           | 18   | .8                          |      |                             |
| LBY           | 19   | .8                          | 16   | 1.3                         |
| SAU           | 20   | .7                          |      |                             |
| KOS           | 21   | .7                          |      |                             |
| JOR           | 22   | .7                          | 22   | .8                          |
| AUL           | 23   | .6                          | 20   | .9                          |
| CHL           | 24   | .6                          |      |                             |
| GME           | 25   | .6                          | 21   | .8                          |
| UGA           |      |                             | 14   | 2.0                         |
| ICE           |      |                             | 15   | 1.8                         |
| MLT           |      |                             | 19   | .9                          |
| ZAM           |      |                             | 23   | .7                          |
| IRQ           |      |                             | 24   | .7                          |
| ITA           |      |                             | 25   | .7                          |
| TOTAL         | 25   | 75.6                        | 25   | 68.3                        |

The table shows great similarity between NYT and TC as follows:

1. Nineteen of the 25 leading NYT actors are also among the leading 25 TOL actors.
2. The leading 25 actors in each source (16% of all actors) are responsible for 75% of all actions reported by NYT and 68% by TOL.
3. The 19 actors common to both lists consist exclusively of countries which are the world's leading powers and/or were involved in active conflict during the period of interest.

Therefore, most of the actions reported by both sources are concentrated in a relatively small fraction of all potential actors, and these actors are essentially the same for both sources.

Additional relevant points are:

1. The leading actor in both sources is the US.
2. TOL reports of UK actions rank second in that source to the US.
3. Of the six NYT actors not among the 25 leading TOL actors:
  - 2 are Western Hemispheric countries (Canada and Chile),
  - 2 are Asian (Laos and South Korea), and
  - 2 are Middle Eastern (Saudi Arabia and Lebanon).
4. Of the six TOL actors not among the leading 25 NYT actors:
  - 2 are African (Uganda and Zambia),
  - 3 are European (Iceland, Malta and Italy), and
  - 1 is Middle Eastern (Iraq).

The geographic locations of these non-common actors correspond generally to the differences in geographic focus noted earlier relative to US and UK initiated actions.

The implication of this display is that while the US and UK differ in their interests and in the allocation of their own attention on geographic, historical, and strategic grounds-- they are similarly attentive with respect to other actors, particularly the powerful and the conflictful.

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What are the comparative interests of the US and UK in the interaction between pairs of countries as conveyed by NYT and TOL?

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A third aspect of the international interests of two countries is the country pairs whose interactions draw their attention. Table 6 identifies the 25 country pairs in NYT and TOL which were highest ranking during the time period under examination in terms of interaction (i.e., total actions reported between each pair). The table was constructed in a manner identical to Table 5.

Table 6, like Table 5, shows similarity in the attention of NYT and TOL as follows:

1. Eighteen of the 25 leading NYT pairs are also common to TOL.
2. The leading 25 pairs in each source (about 1% of all possible pairs) account for about 35% of all actions reported in both sources.
3. The 18 pairs common to both lists consist exclusively of pairs of major powers, pairs experiencing conflict, and major power interaction with individual members of conflict pairs.

Therefore, as was the case for leading actors (Table 5), interest in both sources is concentrated on relatively few pairs, common to both sources.

Additional relevant points are:

1. Eight of the 18 leading pairs common to both sources include the US as a pair member.
2. Of the seven NYT pairs not among the leading 25 in TOL:
  - 5 include the US as a pair member,
  - 1 is an Asian pair (KON-KOS), and
  - 1 is a UK pair (UK-IRE).
3. Of the seven TOL pairs not among the leading 25 in NYT:
  - 5 include UK as a pair member,
  - 1 is a Middle East pair (UAR-LBY), and
  - 1 is a European pair (FRN-GMW).

TABLE 6.

Twenty Five Country Pairs Highest Ranking in Total Interaction, NYT and TOL,  
mid-1971 to mid-1974

| Country Pair | <u>NYT</u> |                                | <u>TOL</u> |                                |
|--------------|------------|--------------------------------|------------|--------------------------------|
|              | Rank       | % of total<br>actions reported | Rank       | % of total<br>actions reported |
| VTN-VTN      | 1          | 7.86                           | 1          | 5.48                           |
| USA-VTN      | 2          | 6.88                           | 2          | 4.04                           |
| USA-USR      | 3          | 3.55                           | 7          | 2.04                           |
| CAM-VTN      | 4          | 2.71                           | 8          | 1.79                           |
| ISR-UAR      | 5          | 1.74                           | 6          | 2.36                           |
| PAK-IND      | 6          | 1.68                           | 3          | 2.87                           |
| ISR-SYR      | 7          | 1.64                           | 4          | 2.46                           |
| USA-VTS      | 8          | 1.17                           | 21         | .57                            |
| USA-ISR      | 9          | 1.14                           | 9          | 1.04                           |
| USA-JAP      | 10         | 1.08                           | 24         | .51                            |
| USA-CPR      | 11         | 1.07                           | 13         | .83                            |
| USA-UAR      | 12         | .88                            | 15         | .71                            |
| USR-CPR      | 13         | .73                            | 10         | .85                            |
| USA-CAM      | 14         | .59                            |            |                                |
| USA-GMW      | 15         | .57                            |            |                                |
| USA-IND      | 16         | .53                            | 23         | .54                            |
| USA-FRN      | 17         | .49                            |            |                                |
| USA-CAN      | 18         | .48                            |            |                                |
| USR-UAR      | 19         | .47                            | 14         | .82                            |
| USA-UNK      | 20         | .45                            | 18         | .60                            |
| ISR-LEB      | 21         | .43                            | 25         | .49                            |
| KOS-KON      | 22         | .43                            |            |                                |
| UNK-IRE      | 23         | .42                            |            |                                |
| GMW-GME      | 24         | .35                            | 12         | .84                            |
| USA-TAI      | 25         | .34                            |            |                                |
| UNK-ICE      |            |                                | 5          | 2.36                           |
| UNK-MLT      |            |                                | 11         | .84                            |
| UNK-USR      |            |                                | 16         | .65                            |
| UNK-FRN      |            |                                | 17         | .63                            |
| UNK-GMW      |            |                                | 19         | .60                            |
| UAR-LBY      |            |                                | 20         | .58                            |
| FRN-GMW      |            |                                | 22         | .57                            |
| TOTAL        | 25         | 35.3                           | 25         | 35.1                           |

These findings suggest that both sources are particularly sensitive to international activity involving the US. They also suggest that where differences in attention exist these differences are largely parochial, i.e., NYT concentrates attention on additional US pairs, and TOL concentrates attention on UK pairs.

The implications here are similar to those of Table 5. While the US and UK differ in the distribution of their own actions, they are similarly attentive to the interactions of conflictful pairs, major power pairs, and major power involvement with conflict pair members. Beyond these common foci US and UK tend to concentrate on their own interactions with other countries.

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How do the US and UK view the quality of their own and each other's actions toward other countries as conveyed by NYT and TOL?

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All prior research questions dealt with selected frequencies and distributions of NYT and TOL reported events as a means to compare US and UK attention to and interest in foreign affairs. The above question and subsequent ones deal with the friendly to hostile quality of reported events as a means to compare US and UK views regarding each other, other country pairs and other individual countries.

Since US and UK are regarded as having a "special relationship", based on, among other things, a "commonality of interests", it might be expected that in most instances the views of the two countries of their actions toward other countries and of the actions of other countries toward themselves would be similar.

Tables 7,8,9, and 10 provide information bearing on this expectation. Tables 7 and 8 display the Policy Styles\* of the US and UK, respectively, toward selected targets as derived from actions reported in both NYT and TOL. Tables 9 and 10 display the Policy Styles of selected actors toward the US and UK, respectively, as derived from the two sources. The various targets in Tables 7 and 8, and actors in Tables 9 and 10 are those which were reported in TOL as directing to or receiving from US and UK a total of 15 or more events over the 36 month time period of interest.

In each table the actors or targets are listed in the order of most positive to most negative Policy Style as derived from NYT. The corresponding Policy Style value derived from TOL is shown. Finally, the difference in Policy Styles (NYT minus TOL) appears. The latter index illustrates the disparity between the views conveyed by the two sources. Positive differences in this index indicate a more positive view in TOL than in NYT; negative differences indicate a more negative view in TOL than in NYT. Positive or negative differences less than .2 suggest no significant difference in view, or correspondence.

Table 7 displays the Policy Style values of the US toward 19 targets. If NYT were truly indicative of US policy (i.e., if it were in effect a spokesman for US governmental policy) then the values listed under NYT would be interpretable as official "signals" to the targets. In this case, TOL plays the role of observer. Its Style values would reflect its observations of US signals toward the targets. In Table 7, then, it might reasonably be assumed that NYT based Style values are more authoritative than TOL based Styles, and, therefore, that the difference in Style reflect misinterpretation by TOL (or UK) of US intent. Tables 8,9 and 10 are subject to similar interpretation.

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\* See Appendix B.

TABLE 7.  
Policy Style of US to Selected Targets,  
mid-1971 to mid-1974

| TARGET | Policy Style |            |                |
|--------|--------------|------------|----------------|
|        | <u>NYT</u>   | <u>TOL</u> | <u>NYT-TOL</u> |
| CAM    | .65          | .57        | -.08           |
| JOR    | .50          | .59        | .09            |
| NATO   | .46          | .04        | -.42           |
| ISR    | .34          | .18        | -.16           |
| CPR    | .29          | .33        | .04            |
| GMW    | .28          | .05        | -.23           |
| UAR    | .27          | .34        | .07            |
| VTN    | .26          | .31        | .05            |
| USR    | .24          | .05        | -.19           |
| JAP    | .21          | .36        | .15            |
| UNK    | .13          | .08        | -.05           |
| MLG    | .12          | .09        | -.03           |
| SYR    | 0            | -.06       | -.06           |
| FRN    | -.07         | .37        | .44            |
| EEC    | -.08         | -.17       | -.09           |
| UNO    | -.15         | -.16       | -.01           |
| IND    | -.17         | -.36       | -.19           |
| VTN    | -.71         | -.73       | -.02           |
| VCG    | -.77         | -.70       | .07            |

TABLE 8.  
Policy Style of UK to Selected Targets,  
mid-1971 to mid-1974

| TARGET | Policy Style |            |                |
|--------|--------------|------------|----------------|
|        | <u>NYT</u>   | <u>TOL</u> | <u>NYT-TOL</u> |
| GMW    | .57          | .17        | -.40           |
| FRN    | .44          | .04        | -.40           |
| CPR    | .27          | .31        | .04            |
| USA    | .15          | 0          | -.15           |
| MLG    | .08          | .20        | .12            |
| EEC    | 0            | .04        | .04            |
| RHO    | 0            | -.26       | -.26           |
| UAR    | 0            | .50        | .50            |
| PAK    | 0            | .55        | .55            |
| IRE    | -.09         | -.55       | -.46           |
| USR    | -.15         | -.24       | -.09           |
| ISR    | -.18         | 0          | .18            |
| MLT    | -.23         | -.31       | -.08           |
| UNO    | -.26         | -.33       | -.07           |
| ICE    | -.67         | -.56       | .11            |
| UGA    | -.90         | -.78       | .12            |
| LBY    | -.90         | -.62       | .28            |

TABLE 9.  
Policy Style of Selected Actors Toward US,  
mid-1971 to mid-1974

| ACTOR | Policy Style |            |                |
|-------|--------------|------------|----------------|
|       | <u>NYT</u>   | <u>TOL</u> | <u>NYT-TOL</u> |
| GMW   | .31          | .12        | -.19           |
| ISR   | .22          | .12        | -.10           |
| JAP   | .22          | .69        | .47            |
| UNK   | .15          | 0          | -.15           |
| EEC   | .05          | 0          | -.05           |
| USR   | -.07         | -.23       | -.16           |
| SAU   | -.09         | .08        | .17            |
| MLG   | -.09         | -.22       | -.13           |
| SYR   | -.19         | -.11       | .08            |
| UAR   | -.26         | -.45       | -.19           |
| VTN   | -.32         | -.30       | .02            |
| FRN   | -.39         | -.31       | .08            |
| CPR   | -.42         | -.48       | -.06           |
| IND   | -.51         | -.84       | -.33           |
| VCG   | -.73         | -.54       | .19            |
| VTN   | -.77         | -.56       | .21            |

TABLE 10.  
Policy Style of Selected Actors Toward UK,  
mid-1971 to mid-1974

| ACTOR | Policy Style |            |                |
|-------|--------------|------------|----------------|
|       | <u>NYT</u>   | <u>TOL</u> | <u>NYT-TOL</u> |
| CPR   | .35          | .32        | -.03           |
| GMW   | .24          | .27        | .03            |
| FRN   | .20          | .22        | .02            |
| USA   | .13          | .08        | -.05           |
| IRE   | -.07         | -.44       | -.37           |
| UAR   | -.15         | .25        | .40            |
| MLT   | -.17         | -.24       | -.07           |
| RHO   | -.24         | -.40       | -.16           |
| USR   | -.53         | -.56       | -.03           |
| ISR   | -.67         | -.69       | -.02           |
| UGA   | -.70         | -.55       | .15            |
| ICE   | -.75         | -.62       | .13            |

Table 11 summarizes an analysis of the Policy Style value differences in Tables 7,8, 9 and 10. The table shows the total number of cases in each analysis, those where views between US and UK correspond and those where misinterpretation is evident, either by US or UK.

The percentage distribution at the bottom of the table reveals that similar views are held in over three fourths (77%) of the total cases. Further, it reveals that where misinterpretation is present, either in NYT or TOL, it tends to be large.

It is these latter cases, where apparent misinterpretation is large, that are of particular interest as a finding of multiple data stream analysis. In such instances, the assumption is that different views are held by US and UK of the same phenomenon and that these views will be the realities which prompt or alter future actions. In MDS, explanations of such cases may and should be sought through both further disaggregation of the data and by review and analysis of the English language event descriptions. An example of such more exhaustive analysis appears in the evaluation of the US-UK pair in the following section.

The implications of the foregoing, however, are that the US and UK do show, for the most part, similar views of the quality of actions each is initiating and receiving in its international affairs. There are exceptions, however, and where they exist they suggest misinterpretation of the signals being transmitted or received by the other.

TABLE 11.

Correspondence and Misinterpretation Between NYT and TOL

| Table   | Policy Style of        | Number of Cases |                    |                   |           |               |           |
|---------|------------------------|-----------------|--------------------|-------------------|-----------|---------------|-----------|
|         |                        | Total           | Correspondence (1) | Misinterpretation |           |               |           |
|         |                        |                 |                    | by <u>NYT</u>     |           | by <u>TOL</u> |           |
|         |                        |                 |                    | Moderate (2)      | Large (3) | Moderate (2)  | Large (3) |
| 7       | US to selected targets | 19              | 16                 |                   |           | 1             | 2         |
| 8       | UK to selected targets | 17              | 10                 | 2                 | 5         |               |           |
| 9       | Selected actors to US  | 16              | 13                 |                   |           | 1             | 2         |
| 10      | Selected actors to UK  | 12              | 10                 | 0                 | 2         |               |           |
| TOTAL   |                        | 64              | 49                 | 2                 | 7         | 2             | 4         |
| PERCENT |                        | 100             | 77                 | 3                 | 11        | 3             | 6         |

(1) Difference in policy styles =  $< .2$ (2) Difference in policy styles =  $.2$  to  $.3$ (3) Difference in policy styles =  $> .3$

---

What are the US and UK views of their own interaction as conveyed by NYT and TOL?

---

The analyses reported here are concerned with the Policy Styles of the US and UK toward each other as conveyed by NYT and TOL. The initial question investigated was whether the two sources perceive each directed dyad (UK→US; US→UK) similarly or not. Four Style timeseries plots were constructed, each showing the NYT and TOL Policy Styles of one actor toward the other during nine quarterly periods. The graphs, shown in Table 12, reveal that one source sometimes leads the other in its perception of a nation's Policy Style.

The specific leads in the data are these:

1. The NYT Policy Style for UK→US leads the TOL Policy Style for the same dyad during the first five time periods;
2. The TOL Policy Style for US→UK leads the NYT Policy Style for the same dyad during the last five periods.

The visual impression of leads was confirmed by comparing the styles conveyed by the two sources in the same time period and at leads of one period. Table 13 reveals that:

1. The absolute differences in NYT and TOL reporting of US→UK style are less when TOL leads NYT by one period than are the differences in the same period. Thus, for this dyad the TOL at time t-1 is a better predictor than TOL at time t.
2. The absolute differences in NYT and TOL reporting of UK→US style are less when NYT leads TOL by one period than the differences in the same period. Thus, for this dyad the NYT at time t-1 is a better predictor than NYT at time t.

This confirms the visual impression of the leads. The impression that in the US→UK dyad TOL's lead is more prominent during the last five periods is confirmed in a similar fashion, as is

TABLE 12.

Policy Style in the UK-US Dyad, mid-1971 to mid-1974

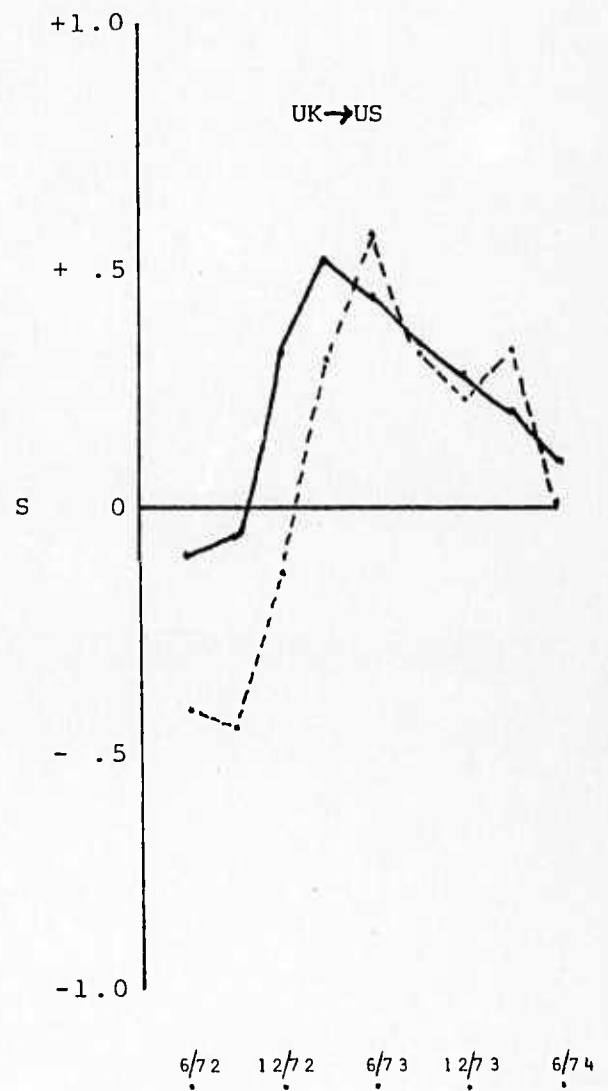
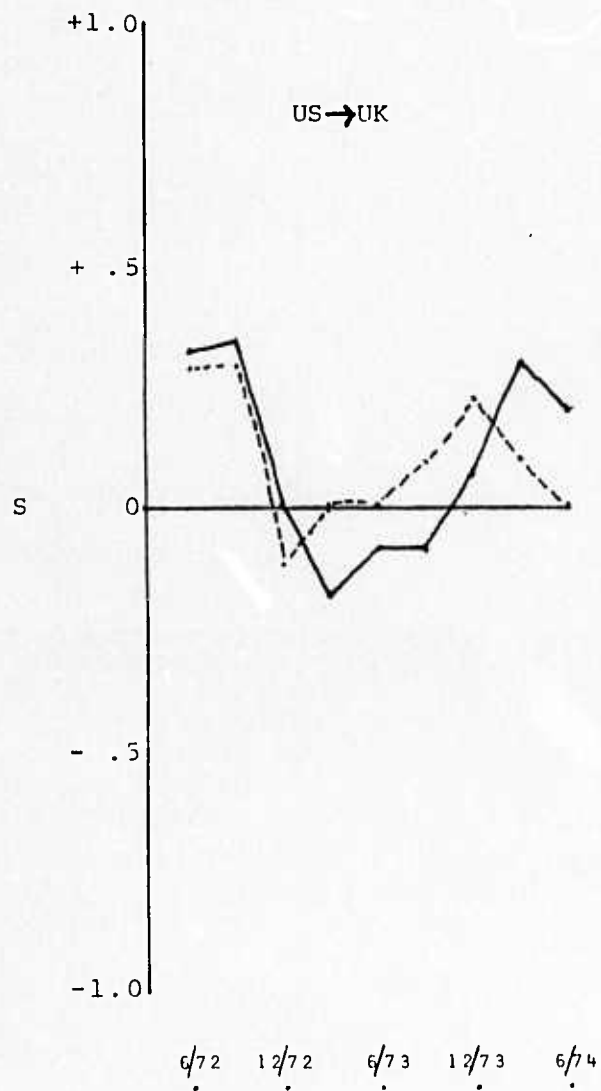


TABLE 13.  
Source Differences in UK-US Style

| Dyad  | Mean Absolute Difference                  |                                               |
|-------|-------------------------------------------|-----------------------------------------------|
|       | $ \underline{TOL}_t - \underline{NYT}_t $ | $ \underline{TOL}_{t-1} - \underline{NYT}_t $ |
| US→UK | .15                                       | .10                                           |
|       | Mean Absolute Difference                  |                                               |
|       | $ \underline{NYT}_t - \underline{TOL}_t $ | $ \underline{NYT}_{t-1} - \underline{TOL}_t $ |
| UK→US | .20                                       | .12                                           |

TABLE 14.  
Effects of Lagging

| Improvement or Worsening in <u>TOL</u> 's Prediction of <u>NYT</u> by Lagging <u>TOL</u> One Period. |                                                                                                                      |                                                                                                                    |
|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Dyad                                                                                                 | Last Five Periods                                                                                                    | Remaining Periods                                                                                                  |
| US→UK                                                                                                | Improvement<br>(average $ \underline{TOL} - \underline{NYT} $<br>difference decreases<br>.10 by lagging <u>TOL</u> ) | Worsening<br>(average $ \underline{TOL} - \underline{NYT} $<br>difference increases<br>.01 by lagging <u>TOL</u> ) |
| Improvement or Worsening in <u>NYT</u> 's Prediction of <u>TOL</u> by Lagging <u>NYT</u> One Period. |                                                                                                                      |                                                                                                                    |
| Dyad                                                                                                 | First Five Periods                                                                                                   | Remaining Periods                                                                                                  |
| UK→US                                                                                                | Improvement<br>(average $ \underline{TOL} - \underline{NYT} $<br>difference decreases<br>.18 by lagging <u>NYT</u> ) | Worsening<br>(average $ \underline{TOL} - \underline{NYT} $<br>difference increases<br>.04 by lagging <u>NYT</u> ) |

the impression that in the UK→US dyad NYT's lead is more prominent during the first five periods. Table 14 shows that in the US→UK dyad, predictions of NYT<sub>t</sub> by TOL<sub>t-1</sub> during the last five periods are better than predictions by TOL<sub>t</sub>, while in the remaining periods the TOL lag is not effective in improving predictions of NYT<sub>t</sub>. Table 14 also shows that in the UK→US dyad, predictions of TOL<sub>t</sub> by NYT<sub>t-1</sub> during the first five periods are better than predictions by NYT<sub>t</sub>, while in the remaining periods the NYT lag is not effective in improving predictions of TOL<sub>t</sub>.

The above observations can be summarized thusly: In some periods, the target's perceptions of an actor's Policy Style leads the actors' perceptions. Visual inspection of Tables 12 and 13 will readily convince one that, with the exception of the lead phenomenon, the view of UK-US interaction conveyed by the two sources is quite similar over time.

The implications of the UK-US dyad analysis thus far are that:

- The two nations did not perceive their interactions very differently, but that
- At times one nation's perceptions of the other's Style anticipated the other's view, suggesting that
- MDS analysis may be helpful in predicting some nation's perceptions of others' policies. But a caution is in order to the effect that
- One nation's ability or tendency to anticipate another's perceptions appears to be transitory.

These observations are intriguing because they initially seem counter-intuitive, and because they constitute phenomena of potential interest to government personnel. They are contrary to the intuitive expectation that a target's perception of an actor's style would follow, not lead, the actor's perception. They are potentially interesting to government personnel who would find useful an ability to forecast Style perceptions by

means of MDS analysis. The analysis therefore turned to a closer examination of the content and explanation of the observed leads.

---

In what subjects are leads contained?

---

Having observed that the lead phenomenon is transitory--present at some times but not at others--we considered possible reasons for its impermanence. We have previously observed that the prominence of different subjects in the affairs of two states varies over time. We reasoned that this variation could contribute to the lead's impermanence. If certain subjects are more than others responsible for the leads, then the coming and going of subject emphases in UK-US interaction could contribute to the transitory nature of the leads. We therefore examined the data to determine whether some subjects more than others are responsible for the observed leads. Each event was coded for the subject with which it was associated. They were coded on the basis of short descriptive abstracts of the events. The abstracts are routinely generated along with the numeric event codes referred to earlier. The subjects upon which the analyses ultimately focused were those for which adequate data were present: Defense, Economic Affairs, Energy and the Middle East, and General Relations.

The result of these analyses showed that certain subjects are more responsible than others for the observed leads. Specifically, the Defense subject is most responsible for the NYT lead in the UK→US dyad while the Economic Affairs subject is most responsible for the TOL lead in the US→UK dyad. The method used to determine the responsibility of a subject for a lead was to extract from the data events dealing with the subject, then to recompute the Styles, and then to recompute the average

absolute difference between the leading source at  $t-1$  and the other source at  $t$ . If this difference was greater than the difference when the subject was still in the data, then we concluded that the subject had made a contribution to the lead. The degree of its contribution depends on how much the source differences increase when the subject is removed from the data. There is also the possibility of a "negative contribution" to the lag, as when after removing a subject the lag is even more prominent. Table 15 shows the effect of removing the four subjects from each dyad. Larger positive values in Table 15 indicate greater responsibility for leads.

Implications of these findings are that:

- While one nation's view of the other's Policy Style may lead--and therefore be a predictor of--the other's view on some subjects, the tendency to lead does not necessarily apply to all subjects. This suggests that
- The policy use of any observed lead should be sensitive to the possibility that the lead is due to specific subjects, and that the lead may quickly disappear if interaction on the responsible subjects is discontinued.

Having found that leads in Policy Style are due in varying degrees to different subjects, we next turned to the task of exploring explanations of the leads. Since different subjects are responsible in varying degrees for leads, we used subjects as cases and attempted to relate subject leads to other explanatory variables.

---

Are Policy Style leads related to emphasis leads?

---

An explanation for why a given subject may contribute to one source's lead in the perception of a nation's Style is that the source may lead the other in its emphasis (concern or weighting) of the subject. Overall Style is a weighted sum of subject-

TABLE 15.  
Contribution of Subjects to Source Leads

|                      | Contribution of<br>Subject to <u>NYT</u> Lead*<br>UK→US | Contribution of<br>Subject to <u>TOL</u> Lead*<br>US→UK |
|----------------------|---------------------------------------------------------|---------------------------------------------------------|
| Defense              | +.06                                                    | +.02                                                    |
| Economic             | -.01                                                    | +.17                                                    |
| Energy               | -.01                                                    | +.01                                                    |
| General<br>Relations | 0                                                       | +.01                                                    |

\*larger positive values indicate larger contributions.

specific Styles, where weighting is on the basis of each subject's share of the total number of events. Thus, to the extent that source A's weighting of a subject follows source B's weighting--and if relatively similar subject-specific Styles are being reported by both sources--the subject will make a contribution to source B's overall Style lead over source A.

We examined our data to determine whether the subject-specific Styles reported by the two sources are relatively similar or not. Eight cases were used in the analysis: each of the four subjects for each of the two directed dyads. The Styles conveyed by the two sources for the entire period covered were calculated and correlated across the eight cases. The product-moment correlation of +.85 confirms that the subject-specific styles of the two sources are related in a positive way. The scatter-plot of these eight cases is shown in Table 16. The assumption of relatively similar subject-specific Styles being met, it remained to examine whether the contribution of a subject to a source's Style lead is related to the source's lead in subject emphasis.

In the analyses designed to examine this question we used those subjects on which both sources had some reports in more than three of the nine time periods in the data. We restricted the analyses to these subjects because even a subject on which an emphasis lead is present could not be expected to contribute significantly to the overall Style lead if that subject were active for a third or less of the time period covered in the study. This restriction leaves five cases for the analysis, not enough to support conclusive results but adequate for an initial examination of the explanation. The development in emphases by the two sources in these five subjects are shown in Tables 17 through 21. Tables 17, 18 and 19 show subject emphases in the UK→US dyad; Tables 20 and 21 show emphases in the US→UK dyad.

TABLE 16.

NYT and TOL Style on Eight Dyad-Subjects

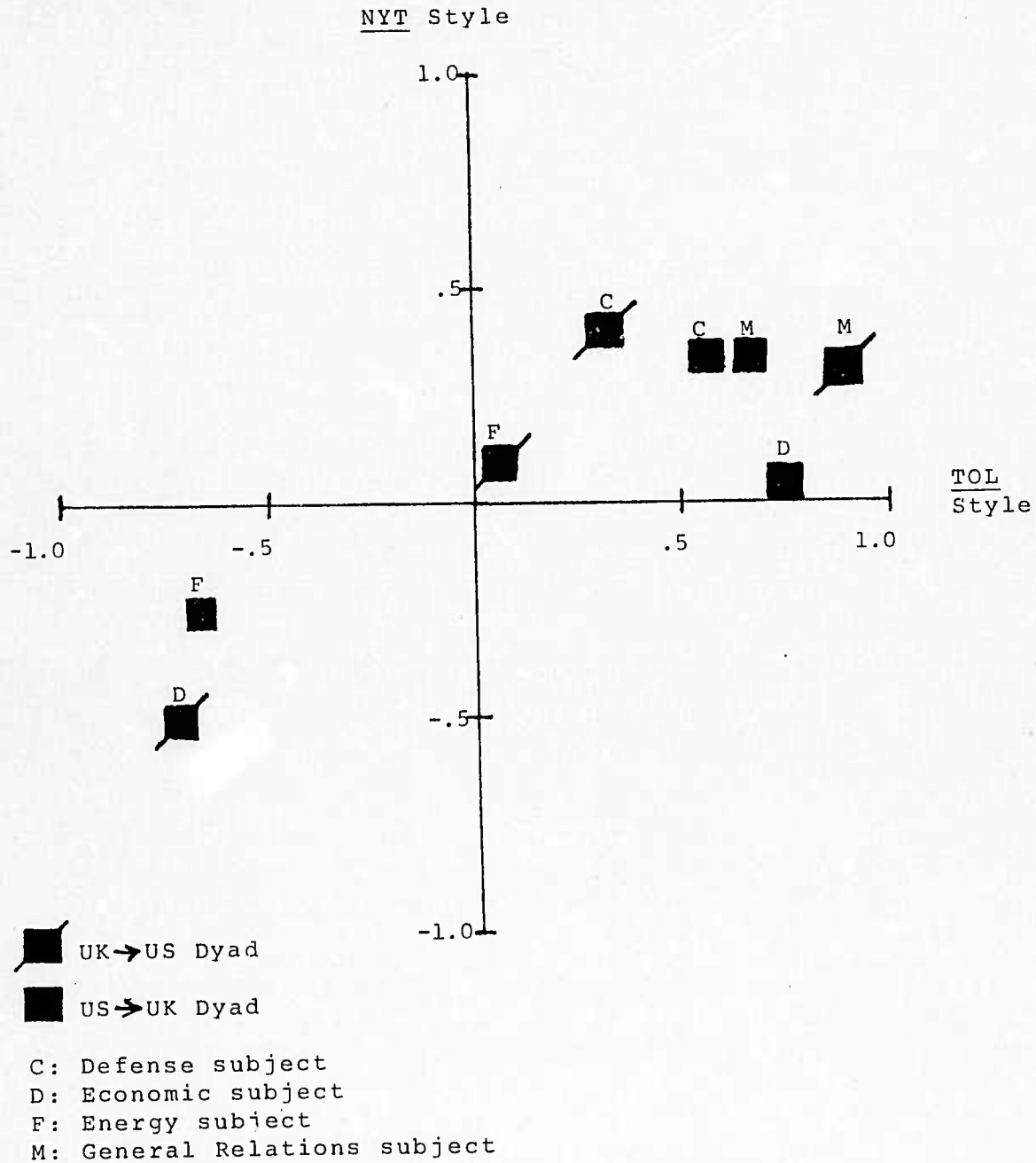


TABLE 17.  
Emphases on Defense for UK→US Dyad

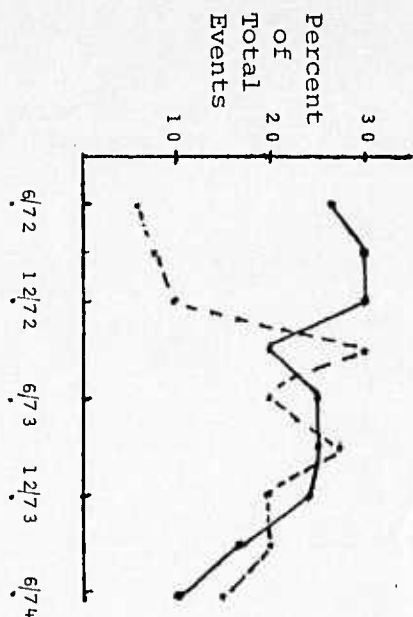


TABLE 18.  
Emphases on Economics for UK→US Dyad

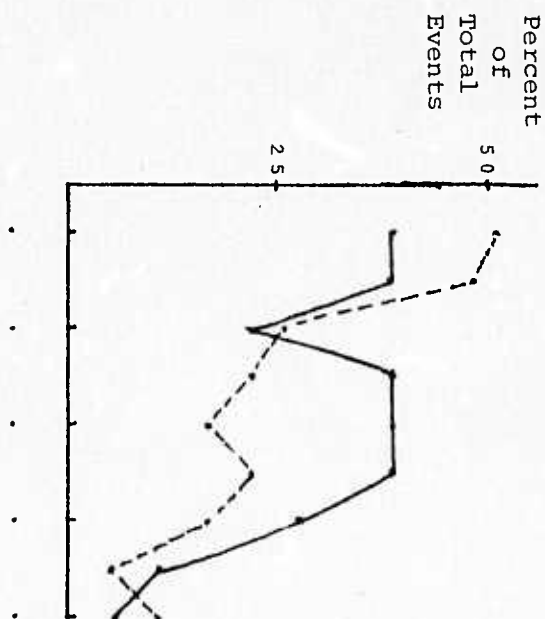


TABLE 19.  
Emphases on General Relations  
for UK→US Dyad

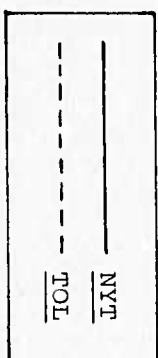
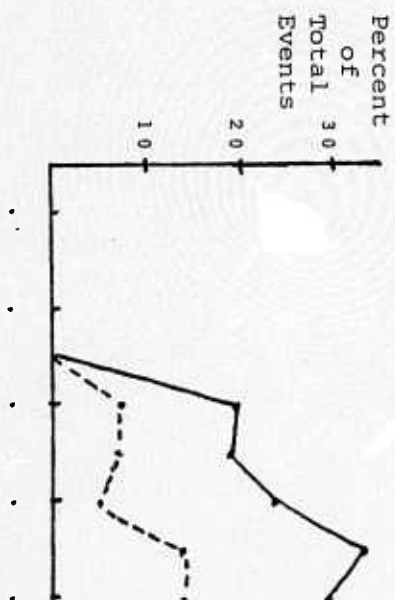


TABLE 20.  
Emphases on Economics for US→UK Dyad

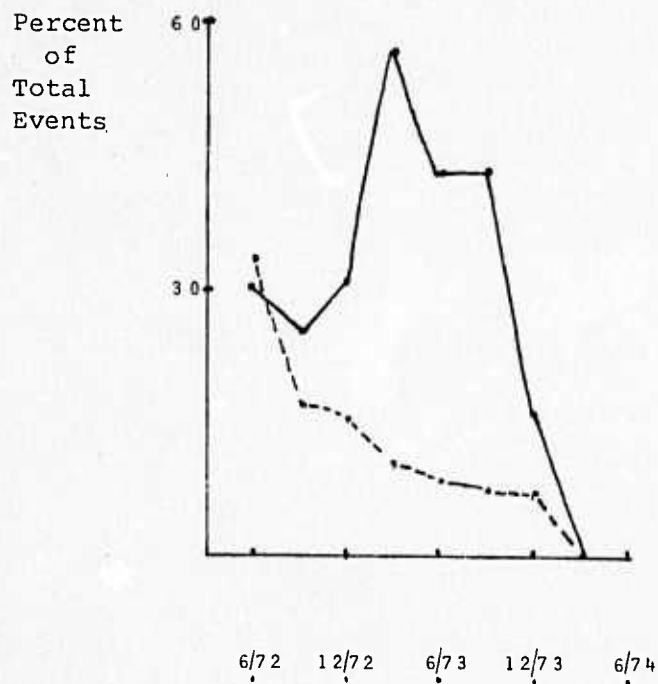
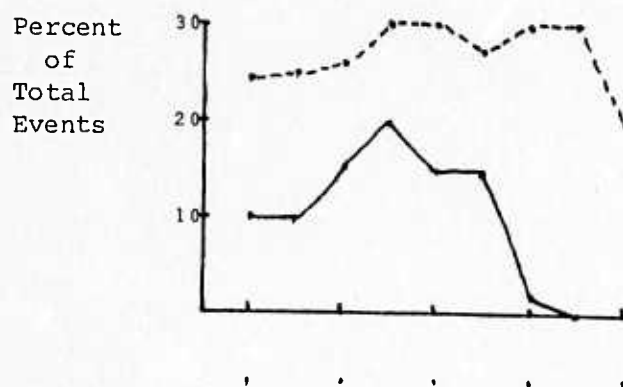


TABLE 21.  
Emphases on Defense for US→UK Dyad



An emphasis lead is apparent to the extent that one source's emphasis lags behind, then "catches up" to the other's emphasis. In the UK→US dyad, such a "catch up" occurs most prominently in the Defense subject (Table 17) where the TOL emphasis lags behind but then catches up to the NYT emphasis. In the US→UK dyad, it is most prominent in the Economics subject (Table 20) where the TOL emphasis clearly portends the future of the NYT emphasis. Thus we find the stronger emphasis leads to be the NYT in the Defense subject in the UK→US dyad, and the TOL in the Economics subject in the US→UK dyad. How do these emphasis leads relate to the Style leads discussed earlier? Referring back to Table 16 we find that in the UK→US dyad, the Defense subject makes the greatest contribution toward the NYT style lead, while in the US→UK dyad the Economics subject makes the greatest contribution toward the TOL style lead. The relationship between style and emphasis leads is then, very clear: the subject most responsible for a source's Style lead is the subject on which the source's emphasis is in the lead.

The main implication of these findings seemsto be that:

- a nation tends to correctly anticipate another's view of the quality of their affairs when it correctly anticipates the relative attention that will be given to different subjects.

This implication is quite plausible, since different subjects are characterized by different qualities of behavior. For example, one could go far in predicting the future quality of US-Soviet relations if the subjects on which attention will be focused could be predicted, for the quality of each nation's behavior varies across subjects such as emigration, the Middle East, China, economic relations, and so forth. The foregoing demonstrates a potential application of MDS analysis in the identification of subject emphasis leads and therefore in the forecasting of nation's views of the quality of their behavior, as these are conveyed by news sources.

The discovery that emphasis leads are associated with Style leads provoked an additional question: How is it that one source comes to anticipate the emphases of another? More specifically, how is it that the target nation's view of the actor's emphases happens to precede the actor's own view of its emphases, which is the case we have in our data? The following section reports on an explanation that was advanced and examined.

---

Are emphasis leads associated with differential coverage of bureaucratic actors?

---

It seems very likely that the upper echelons of foreign policy bureaucracy--including the head of government--would initiate trends in the focus of policy actions, which trends subsequently would be realized at lower levels of bureaucracy. This has the implication that if two sources are reporting the policy statements and actions of a nation, the source deriving a greater proportion of its reports from the higher bureaucratic levels would lead--in subject emphasis--a source deriving a higher proportion of its reports from the lower levels. We examined this implication by asking whether, in our data, the subjects on which a source has an emphasis lead also are characterized by that source focusing its attention on higher bureaucratic levels more than the source that it leads.

From the previous section it is known that the two greatest emphasis leads out of the five dyad-subject combinations considered are: (1) NYT leads TOL in the Defense subject in the UK→US dyad; and (2) TOL leads NYT in the Economic affairs subject in the US→UK dyad. Therefore, we would expect, according to the implication above, that:

1. In the UK→US dyad, NYT reports a greater percentage of defense events from higher bureaucratic levels than the percentage TOL reports; and
2. In the US→UK dyad, TOL reports a greater percentage of economic affairs events from higher bureaucratic levels than the percentage NYT reports.

We considered the President, his foreign policy adviser and cabinet members to comprise upper levels for the US, and the Prime Minister and his ministers and secretaries to constitute upper levels for the UK. Lower level actors in each case include undersecretaries, representatives to talks and negotiations, and so forth. Table 22 shows that the two expectations are borne out by the data.

Table 22 shows that the two greatest cases of emphasis lead are also cases in which the leading source reported a greater percentage of events from the higher bureaucratic levels.

We would also expect the percentages to differ between the two sources less on the remaining three dyad-subjects discussed in the previous sections, for emphasis leads were less noticeable in these three cases. Table 23 shows that there were some differences, and one of these (defense in the US→UK dyad) was greater than one of the differences in Table 22, while the other two differences are, as expected, less.

Thus, one case out of the five is contrary to the idea that one source will lead another's subject emphasis to the extent that its attention is focused relatively more upon higher bureaucratic levels. Considering, however, that four out of five cases were consistent with the idea, we can say there is an imperfect tendency in the expected direction of the relationship. Such a tendency is adequate at this state of MDS research to suggest further explorations along these lines.

TABLE 22.  
Source Emphases on Higher Bureaucratic Levels

| Dyad  | Subject  | Percent of Events From Higher Levels |            |
|-------|----------|--------------------------------------|------------|
|       |          | <u>NYT</u>                           | <u>TOL</u> |
| US→UK | Economic | 44                                   | 80         |
| UK→US | Defense  | 82                                   | 60         |

TABLE 23.  
Source Emphases on Higher Bureaucratic Levels

| Dyad  | Subject           | Percent of Events from Higher Levels |            |
|-------|-------------------|--------------------------------------|------------|
|       |                   | <u>NYT</u>                           | <u>TOL</u> |
| US→UK | Defense           | 100                                  | 72         |
| UK→US | Economic          | 84                                   | 66         |
| UK→US | General Relations | 75                                   | 70         |

The main implication of the foregoing is that:

- A nation increases its chances of correctly anticipating another's view of subject emphases by focusing its attention on the other's high level foreign policy actors.

---

How do US and UK view the quality of interaction between other pairs of countries as conveyed by NYT and TOL?

---

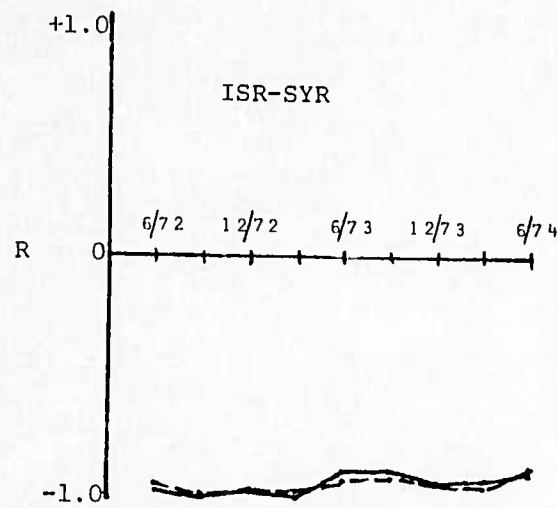
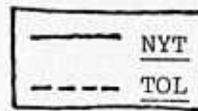
This question is different in an important respect from those posed previously. Here, US and UK are both observers rather than participants in the interaction. The opportunity exists, therefore, to compare US and UK observations of signals emitted elsewhere, and to see how similar and different are their resulting views across time.

Eight cases were selected for examination. These cases consist of pairs of countries having a current or past history of local conflict and/or periodic crisis. For all these cases it is of interest to examine the overall correspondence between views separately emanating from NYT and TOL. In addition, for certain of the cases, where overall correspondence is low or when the views differ in other respects it is of interest to seek interpretation.

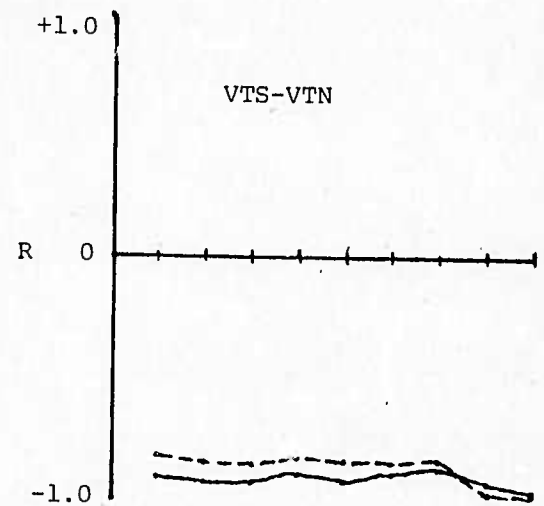
Table 24A and its continuation, Table 24B, present plotted time series of relations between each of the eight country pairs, as derived from both NYT and TOL. Relations (R) values appearing in the displays are computed each three months for the previous 12 month time period. For example, the first R value in each curve (at 6/72) is based on events reported from mid-1971 through mid-1972, the second R value is based on events reported from October 1971 through September 1972, and so on.

TABLE 24A.

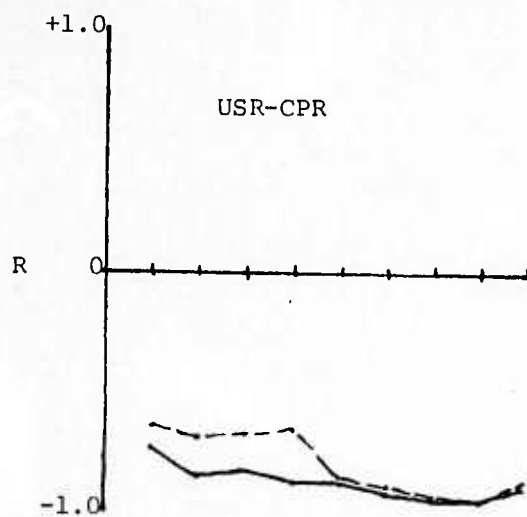
Relations and Differences in Relations for Selected Pairs, mid-1971 to mid-1974



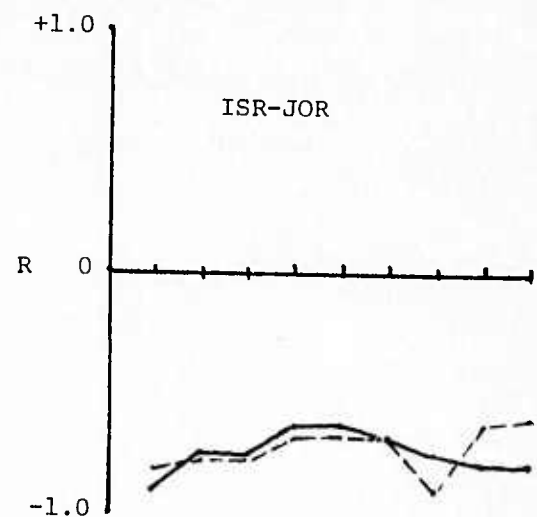
$|D_R|$  .03 .01 .01 .02 .03 .03 .01 .04 .01



$|D_R|$  .09 .08 .07 .09 .09 .07 .04 .03 .02

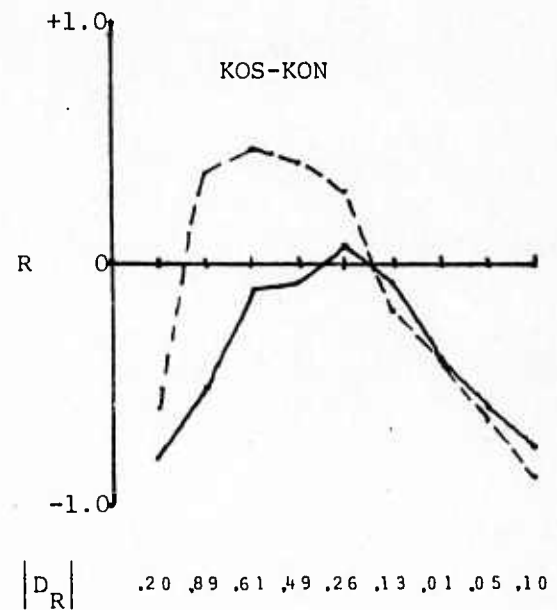
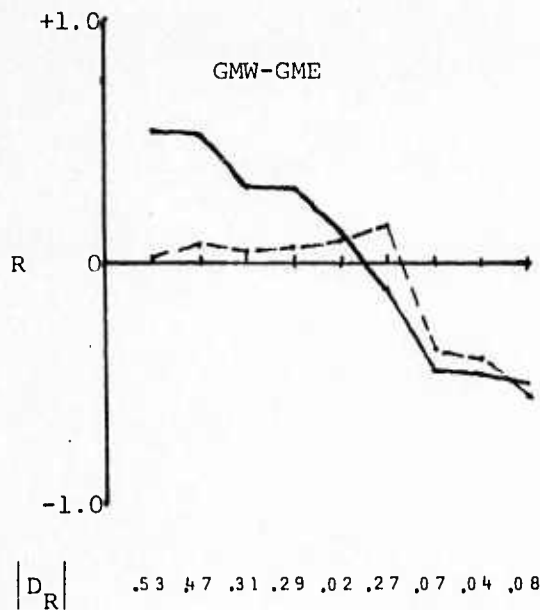
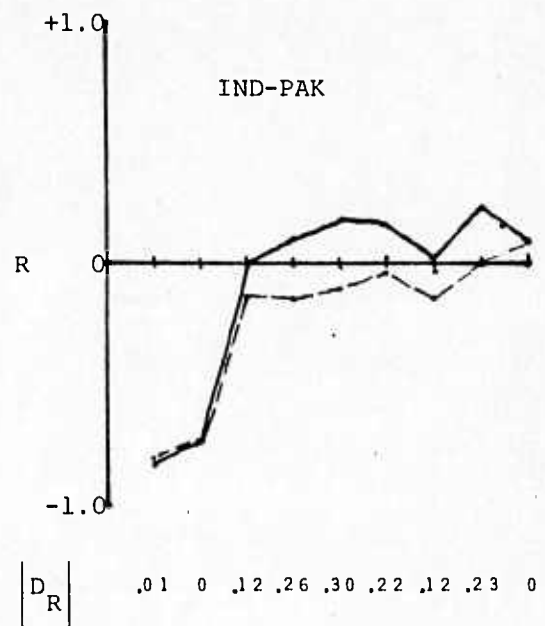
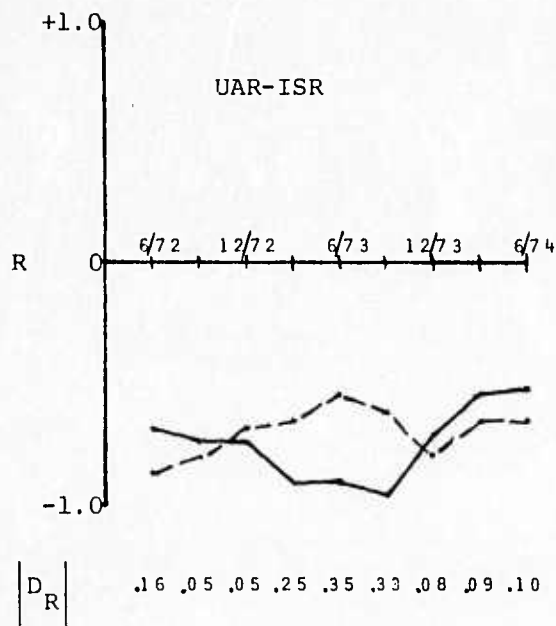
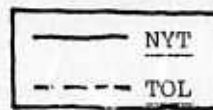


$|D_R|$  .10 .13 .14 .22 .01 .03 .0 .0 .01



$|D_R|$  .09 .01 .0 .05 .05 .0 .12 .18 .20

TABLE 24B.



Correspondence between the two sources is suggested by absolute difference in R values at each point in time,  $(|D_R|)$ . These values appear below each graphical display. A measure of the overall correspondence in views between the two sources is the mean of  $|D_R|$ . These mean values are presented in Table 25, where the pairs are ranked from closest correspondence to least correspondence. The maximum  $|\bar{D}_R|$  is 2.0. Based on this statistic alone it would appear that there is good correspondence between NYT and TOL in six of the eight cases. But it is clear from inspecting the graphical displays and the individual values of  $|D_R|$  that correspondence varies considerably within cases. For example, in the case UAR-ISR there is important lack of correspondence during the 9 month period prior to the last quarter of 1973, when the Yom Kippur War occurred. In this case, in retrospect, NYT was a better predictor of the likelihood of conflict occurring. On the other hand, in the case of KOS-KON, close correspondence exists in the latter stages of the time series. But in this instance TOL was an earlier harbinger of the attempt at reconciliation between this pair. The same is true with respect to GMW-GME, where treaty preparations in the early part of the period were viewed more positively by NYT than TOL. Both source views converge later into close correspondence.

What is suggested here is that correspondence in observation is neither necessarily continuous nor desirable. In multiple data stream analysis, temporary incongruence in views takes on importance in signalling differences in interpretation of international affairs.

The implications of this analysis then for the US are that two (or more) views based on separate observation of foreign affairs can provide signals of changes underway or in prospect that might be absent or ignored as components of a single view. Therefore, continuous monitoring of multiple data streams for

TABLE 25.

Overall Correspondence Between NYT and TOL in Their Views of  
Interaction Between Eight Selected Country Pairs

| Country Pair | Overall Correspondence in View<br>$ \bar{D}_R $ |
|--------------|-------------------------------------------------|
| ISR-SYR      | .02                                             |
| VTS-VTN      | .07                                             |
| USR-CPR      | .07                                             |
| ISR-JOR      | .08                                             |
| PAK-IND      | .14                                             |
| UAR-ISR      | .16                                             |
| GMW-GME      | .23                                             |
| KOS-KON      | .30                                             |

selected country pairs can prompt timely searches for and examination of explanations when incongruence between views occurs.

Since our assumption is that two countries which observe and interpret international interactions differently (e.g., as in the UAR-ISR or KOS-KON cases) may be expected to behave differently, then a further implication exists. That is, the likelihood of mutual attention to and similar actions toward a situation by US and UK is diminished to the extent that their views of the urgency of and inherent quality of the situation differ. Multiple data stream analysis can alert the analyst to the basis for differences in view and help to estimate the potential for agreement or joint action in the situation.

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What are the alignments of US and UK toward selected other countries and conflict pairs as conveyed by NYT and TOL?

---

Alignment is an important and complex concept in foreign affairs. In the context of event data, Alignment may be represented by:

1. the similarity between two countries in the friendly to hostile quality of their behavior toward other countries. For example, by assessing how similar in quality are the separate actions of US and UK toward China the informal alignment of US and UK relative to China may be inferred.
2. the similarity of the behavior of one country toward two other countries. For example, by assessing how similar are the actions of UK toward the US and USSR the relative alignment of UK to each may be inferred.

These concepts are susceptible to more meaningful measurement and interpretation with multiple data streams than with a single source of data. With multiple data streams it is possible to use an indigenous source to represent a country's own behavior, e.g.,

TOL may represent signals of UK behavior and NYT signals of US behavior. With only a single source, say NYT, the Alignment concept can be measured only by combining signalled (US) behavior with observed (UK) behavior. This type of combination, however, might be expected to yield the US view of the Alignment. By contrasting single and multiple source measurements, it is possible to identify cases where similarities and differences appear to exist between implied US and UK impressions of Alignment.

Table 26 presents scores indicating the degree of Alignment between the US and UK toward 21 target countries. The Alignment score is the arithmetic difference between the Policy Style of the US and UK toward each target. In the table, the UK Style value is subtracted from the US value in all cases. Therefore, positive Alignment scores indicate that UK behavior toward the target is more positive than US behavior. Negative scores indicate the opposite. The maximum range of this indicator of Alignment is  $\pm 2.0$  (e.g., a score achieved when one actor's Policy Style is +1.0 and the others' is -1.0 toward a target). Given the generally mutual and supportive interests of US and UK, it might be expected that relatively low scores (close Alignment) would predominate.

Table 26 presents one to three Alignment scores for each target, depending on whether the data were sufficient for the necessary calculations. The column "signalled views" reflects the Policy Styles of each indigenous source toward the target, i.e., the Style of US  $\rightarrow$  Target calculated from NYT data minus the Style of UK  $\rightarrow$  Target calculated from TOL data. The "US view" and "UK view" scores are based on Policy Style values for single sources, NYT and TOL, respectively. The targets are ranked in the table from those toward whom the signalled view of US-UK Alignment is closest to those toward which it is most distant. In the table, the signalled view of Alignments between US and UK are generally

TABLE 26.

Three Views of the Alignment of US and UK Toward  
Selected Target Countries, mid-1971 to mid-1974

| Target<br>Country | Signalled<br>View | US<br>View | UK<br>View |
|-------------------|-------------------|------------|------------|
| JOR               | 0                 |            | -.09       |
| CPR               | .02               | -.02       | -.02       |
| POL               | .03               |            | .33        |
| ITA               | -.05              |            | -.17       |
| JAP               | -.06              | .01        | -.21       |
| GRC               | -.10              |            | -.10       |
| FRN               | .11               | .51        | -.33       |
| GMW               | -.11              | .29        | .12        |
| PAK               | .11               |            |            |
| IRN               | -.15              |            |            |
| CHL               | .17               |            | .15        |
| UAR               | .23               | -.09       | .16        |
| IRQ               | -.25              |            |            |
| SAU               | -.25              |            | -.24       |
| GME               | .27               |            |            |
| AUL               | .31               | -.59       |            |
| INS               | .33               |            |            |
| ISR               | -.34              | -.52       | -.18       |
| IND               | .44               |            | .63        |
| USR               | -.48              | -.39       | -.29       |
| TUR               | -1.03             |            |            |

Note: ● Positive scores indicate that UK behavior toward the target is more positive than US behavior.

- Negative scores indicate that UK behavior toward the target is more negative than US behavior.

as expected, i.e., the scores tend to be relatively low. The ordering of targets in terms of closeness of Alignment between US and UK appears to be intuitively proper, as well.

Of more interest, from the standpoint of MDS analysis, are the differences among the scores for certain cases. For example, close US-UK Alignment is signalled toward France, with UK slightly more positive than US (.11). The US view, however, shows UK considerably more positive toward France (.55), while the UK view is the opposite, with US significantly more positive (-.33). Also, for example, in the case of Israel, the UK view is that it is not nearly so much more negative (-.18) than the US view (-.52) or the signalled view (-.34). Finally, in the case of USSR neither the US view nor the UK view match the signalled degree of relative UK negativity.

The implications of this kind of analysis, assuming once more that NYT and TOL are appropriate surrogates for official views, and that such views are precursory to later behavior, are that multiple observations--from different points of view--can provide insights and inferences relative to prospective behavior which are not inherent in any single set of observations.

A second aspect of the Alignment concept deals with the degree to which one country differentiates between two (or more) others. For example, in Cold War rhetoric it became conventional to attempt to categorize countries as being aligned with the US, or with the USSR, or being "neutrals".

This notion may be measured by employing the Policy Styles of a country toward two other countries which themselves are central to some issue arena. In Table 27 the Alignments of UK relative to eight pairs of countries which represent distinct issue arenas are shown. The Policy Style of UK to each pair member based on TOL, is displayed in the first column of the

TABLE 27.

UK View of its Alignment in Selected Issue Arenas

| Issue Arena<br>Country Pairs | Policy Style of UK→Target,<br>from <u>TOL</u> | Alignment of UK<br>in Issue Arena |
|------------------------------|-----------------------------------------------|-----------------------------------|
| FRN<br>GMW                   | .04<br>.17                                    | .13                               |
| GMW<br>GME                   | .17<br>0                                      | .17                               |
| IND<br>PAK                   | .27<br>.55                                    | .28                               |
| IRN<br>IRQ                   | 0<br>.33                                      | .33                               |
| GRC<br>TUR                   | .22<br>-.25                                   | .47                               |
| UAR<br>ISR                   | .50<br>0                                      | .50                               |
| JOR<br>ISR                   | .50<br>0                                      | .50                               |
| USR<br>CPR                   | -.24<br>.31                                   | .55                               |

table. The second column displays the Alignment score, which in this instance is the absolute arithmetic difference between UK Style values to each pair member. The pairs are listed in the table from the lowest Alignment score to the highest. A low score means that UK, in its own view (TOL), does not differentiate significantly between the pair, or implicitly, in the issue arena. Higher scores indicate that differentiation does exist, i.e., that UK is more closely aligned with one of the pair than the other. The maximum possible score for this index is 2.0. Reference to the Policy Style values in the table indicates with which country UK Alignment exists and the nature of the Alignment.

For example, in the case of USSR-CPR, UK views itself supportive of CPR ( $S=.31$ ) and opposing USSR ( $S=-.24$ ) for an Alignment score for this pair of .55. For UAR-ISR, the Alignment score is virtually as high (.50), but is qualitatively different. In this case UK views itself as supportive of UAR ( $S=.50$ ) and neutral toward ISR ( $S=0$ ). At the other extreme, FRN-GMW is a case in which UK shows little differentiation in behavior between the pair members (.13), i.e., it does not align significantly with either pair member, while being essentially neutral toward FRN ( $S=.04$ ) and mildly supportive of GMW ( $S=.17$ ).

The implication of this analysis, of course, is that if a media source can be used as surrogate for governmental position then a source indigenous to any country can be used to locate its country's Alignment position relative to significant world issues. Furthermore, given sufficiently long streams of data from multiple sources there is no reason why trends and changes in these Alignment postures cannot be represented in addition to the static thirty-six month illustrations employed here.

## FUTURE ACTIVITIES

The foregoing section has illustrated the principal similarities and differences in national attention, interest and point of view that are inherent in the observation of international affairs from different national perspectives, and which may be revealed by applying MDS techniques of analysis.

What remains to be done in completing this initial illustration of the MDS approach is to address the question of the utility of the approach to the national security community more directly. To this end, it is planned to focus on a particular region (e.g., the Middle East) or a problem (e.g., energy) and analyze it in detail.

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## STATUS OF SHORT TERM FORECASTING RESEARCH

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Historical analogies are frequently used as the basis for judgmental forecasts. Specifically, if the dimensions of a current situation are perceived to be similar to those of some previous situation, then, other things equal, the probable outcome of the current situation is assumed to be similar to the actual outcome of its past analogue. The premise of such forecasting is that behavioral patterns exist independent of their time and place of occurrence. In this sense history is assumed to be repetitive and, therefore, to provide a basis for prediction.

In its quantitative form, this approach to forecasting may be pursued both by univariate time series analysis and by multivariate cross-sectional analysis. Univariate time series analysis limits attention to a single variable--that one for which a forecast is sought--and employs a large number of cases to segregate historical patterns and their outcomes. The unique distribution of outcomes associated with an historical pattern is employed as the probabilistic forecast distribution for cases which currently conform to the same pattern.

In previous ARPA supported research, the first attempts at translating this forecasting approach to quantitative terms yielded promising results.<sup>1</sup> Time series analysis of the histories of Relations and Policy Style measures for sizeable samples of country pairs revealed past patterns of behavior which were associated with statistically significant differences in subsequent outcomes. One set of objectives of the present short

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<sup>1</sup> See Preliminary Investigation of a Technique for the Short Term Forecasting of Selected International Indicators, International Affairs Center, CACI, Inc.

term forecasting research is to attempt to replicate and extend the earlier results, validate forecasts based on the results, and demonstrate the utility of the forecasting technique.

In addition to univariate patterns across time, analogies may also be drawn from cross-sectional patterns across multiple variables. In the first instance, time is the patterning dimension for a single variable. In the latter instance, the values of multiple variables are assumed to pattern at discrete moments in time.

The cross-sectional approach has a special attribute. It permits the composite of values of several variables to represent a complex phenomenon. For example, we do not yet have a satisfactory means to detect the onset of crisis between countries. But we can represent crises known to have occurred in terms of variables which have been measured. That is, we might identify recent crises which have occurred, stipulate all the measurable variables we believe to be of relevance to crisis, and determine which of these variables have "special" values preceding the crises in question.

Those variables and values represent a pattern of conditions which can be used to define the precursor analogue of crisis. Future crises, then, may be forecast when similar patterns of conditions are observed currently. A second set of objectives of the present short term forecasting research is the preliminary development and illustration of this multivariate approach. This research may be considered successful if a unique set of variables and values is generally found to be present in temporal proximity to the crisis cases but rarely in proximity to other cases.

## RESEARCH FINDINGS--UNIVARIATE TIME SERIES ANALYSIS

In the previous research, five historical patterns were found in time series of the Relations (R) and Policy Style (S) measures. These patterns were associated with different and statistically significant distributions of the subsequent changes in R and S.

The historical patterns were found by examining three variables:

1. the average fluctuation of all time series values around the most current value ( $\bar{F}$ ),
2. the magnitude of the difference between the beginning and most current value (D), and
3. the uniformity in the direction of change, if any, from the beginning to the current value (U).

The five patterns manifest the following characteristics in terms of these three variables:

| Pattern | $\bar{F}$        | D         | U            |
|---------|------------------|-----------|--------------|
| 1.      | $\leq .10$       | $< .2$    | not relevant |
| 2.      | $> .10 \leq .20$ | $\geq .2$ | yes          |
| 3.      | $> .10 \leq .20$ | any value | no           |
| 4.      | $> .20$          | $\geq .2$ | yes          |
| 5.      | $> .20$          | any value | no           |

Subjectively the patterns may be described as follows:

Pattern #1: Time series values fluctuate little and change little from beginning to end. This pattern may be referred to as Stable.

Patterns #2 and #4: Time series values have moderate (#2) or high (#4) fluctuation, combined with a significant change in level (D) from beginning to end which proceeds uniformly in direction,

i.e., without reversal. These patterns may be referred to as Moderate (#2) and Major (#4) Level Changes.

Patterns #3 and #5: Time series values have moderate (#3) or high (#5) fluctuation, which occurs without apparent pattern and with no uniformity in direction. These patterns may be referred to as Moderately (#3) or Highly (#5) Unstable.

In the experiments involving time series of the Relations measure (R), based on 74 cases (pairs of countries), the subsequent distributions of  $\Delta R$  across the patterns were found to be significantly different.  $\Delta R$  is the change in the value of R between the end values of the historical time series and a period 24 months later. The values of  $\Delta R$  were classified as:

- Low, where  $\Delta R \leq \pm .2$ <sup>1</sup>
- Medium, where  $\Delta R > \pm .2 \leq \pm .4$ <sup>1</sup>
- High, where  $\Delta R > \pm .4$

Table 28 presents the  $\Delta R$  distributions for the 74 cases for each of the five patterns. In Table 29 these distributions are converted to percentages.

The percentage distributions in Table 29, are, in effect, probability distributions of future outcomes associated with each pattern. As such, they may, in the absence of other information or in combination with it be used as the likely outcome distributions for cases which currently conform to each of the historical patterns. That is, we can use these distributions as estimates, or forecasts, of likely changes in Relations over the next two years between country pairs whose past analogue we may calculate empirically.

It is worth noting that the distributions in Table 29 seem intuitively correct in the following ways:

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<sup>1</sup> A  $\Delta R$  value of .2 equals a change of 10% of the R scale, which ranges from +1.0 to -1.0; a  $\Delta R$  value of .4 equals a change of 20% of the R scale.

TABLE 28.  
Frequency Distribution of  $\Delta R$  by Historical Pattern  
for 74 Country Pairs

| Pattern                 | Number<br>of<br>Cases | $\Delta R$ (24 months) |        |      |
|-------------------------|-----------------------|------------------------|--------|------|
|                         |                       | Low                    | Medium | High |
| 1.Stable                | 20                    | 14                     | 4      | 2    |
| 2.Moderate level change | 9                     | 7                      | 2      | 0    |
| 3.Moderately unstable   | 17                    | 5                      | 7      | 5    |
| 4.Major level change    | 14                    | 7                      | 4      | 3    |
| 5.Highly unstable       | 14                    | 3                      | 4      | 7    |
| TOTAL                   | 74                    | 36                     | 21     | 17   |

TABLE 29.  
Percentage Distribution of  $\Delta R$  by Historical Pattern  
for 74 Country Pairs

| Pattern                  | $\Delta R$ (24 months) |     |        |      |
|--------------------------|------------------------|-----|--------|------|
|                          | Total                  | Low | Medium | High |
| 1. Stable                | 100                    | 70  | 20     | 10   |
| 2. Moderate level change | 100                    | 78  | 22     | 0    |
| 3. Moderately unstable   | 100                    | 30  | 40     | 30   |
| 4. Major level change    | 100                    | 50  | 29     | 21   |
| 5. Highly unstable       | 100                    | 21  | 29     | 50   |
| TOTAL                    | 100                    | 49  | 28     | 23   |

1. Pairs with stable histories of Relations (Pattern #1) are shown to be inclined to remain stable.
2. Pairs whose Relations change moderately in level (Pattern #2) are shown to exhibit a tendency toward stability at the new level; pairs whose Relations change drastically in level (Pattern #4) are also inclined to stabilize at the new level, but there is also a significant tendency to "rebound".
3. Pairs whose Relations are unstable (Patterns #3 and #5) tend to be the least "predictable"; i.e., for Pattern #3 in particular the future is almost totally uncertain. Pattern #5, which reflects wide past fluctuations in Relations also shows the greatest tendency toward large future changes.

It should also be noted here that identical patterns and highly similar distributions of subsequent change were found when the experiment was extended to the Policy Style (S) measure. In that experiment, 85 country pair cases were employed.

These results prompted a series of questions which have been and are being addressed in current research on univariate time series analysis. The questions dealt with to date are stated below along with related findings.

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How representative was the distribution of  $\Delta R$  for the case sample employed to develop the historical patterns?

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The 74 cases employed in previous experiments with the Relations measure were not randomly chosen. The sample was constrained in two dimensions. First, because of limited time series lengths (1966 through 1972), each country pair contributed only one  $\Delta R$  value. That is, the historical time series covered the period 1966-1970 and  $\Delta R$  was measured for 1971 plus 1972; five years of history was employed to make a two year forecast. Therefore, the case sample reflects changes in Relations for a wide array of country pairs but for just one time period, 1971 plus 1972.

Second, the country pairs employed were limited to pairs of individual countries (e.g., USA and USSR). Since the Relations measure may be computed for groups of countries as well (e.g., USA and the World, or NATO and Warsaw Pact Countries, or all Arab Countries), or may be computed within country pairs by subject or issue (e.g., Military Relations between USA and USSR) the potential sample could have been differently constituted.

In Table 30 the percentage distributions of  $\Delta R$  across two year periods are recorded for the original sample (Sample 1) and for two additional samples, chosen to test the consistency of the  $\Delta R$  distribution by eliminating the above sampling constraints. Sample 2 consists of all 24 month changes in R throughout the available time history for the original 74 country pair cases. Sample 3 consists of the  $\Delta R$  distribution over the original time period (1971 plus 1972) but for a composite of 69 pairs of country groups and issues with country pairs.

The table shows that for 74 country pairs the 1971-1972  $\Delta R$  distribution (Sample 1) was almost identical to the distribution across the entire time history (Sample 2). The implication here is that had any sample of time periods for country pairs been chosen randomly the  $\Delta R$  distribution would have been similar to that in the original sample employed. On the other hand the  $\Delta R$  distribution for country pairs and issue pairs (Sample 3) differs somewhat from the others. Specifically, for pairs of this type there seems to be less of a tendency toward high  $\Delta R$  and more of a tendency toward medium  $\Delta R$  than in the country pair samples. This finding suggests either that the historical patterns for pairs of these types differ from those for country pairs or that the same patterns yield somewhat different distributions of  $\Delta R$  for forecasting purposes.

TABLE 30.

Distribution of  $\Delta R$  For Three Samples

| Sample                                                                                                              | Percentage Distribution of $\Delta R$ |     |        |      |
|---------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----|--------|------|
|                                                                                                                     | Total                                 | Low | Medium | High |
| 1. Original sample<br>(74 country pairs,<br>one time period)                                                        | 100                                   | 49  | 28     | 23   |
| 2. 74 country pairs,<br>all time periods                                                                            | 100                                   | 50  | 28     | 22   |
| 3. Composite sample of<br>country groups and<br>issues<br>(69 pairs, same one<br>time period as<br>original sample) | 100                                   | 46  | 41     | 13   |

---

What are the historical patterns and  $\Delta R$  distributions for country group pairs and issue pairs?

---

Tables 31 and 32 show the frequency and percentage distributions of  $\Delta R$ , respectively, for the composite country group and issue sample of 69 pairs.  $\Delta R$  covers the 1971 plus 1972 time period, the same period employed in the original experiments. By comparing the distributions in Table 32 with those presented earlier in Table 29 the difference between country pairs and country groups may be seen.

It is interesting to note that the  $\Delta R$  distributions for Pattern 1 are quite similar for both samples. Specifically, cases with a stable history tend to manifest low propensity for change. On the other hand, where a moderate or major level change occurred historically (Patterns 2 and 4) the dominant ensuing change for country group and issue pair cases is a moderate subsequent change in R, whereas in the country pair sample, this pattern had been followed with stability of R near the new level. Finally, the country group-issue pair sample shows less tendency toward high changes in R for cases which were historically unstable (Patterns 3 and 5). These cases, however, like those in the original sample, are less predictable than cases manifesting any other pattern, i.e.,  $\Delta R$  is more equally distributed across the low, medium, and high ranges of subsequent values than it is for any other pattern.

The implication of these findings is that while historical patterns may be similarly deduced for different kinds of case samples, the subsequent  $\Delta R$  distributions may be sufficiently different that their use for forecasting must be restricted to like cases.

TABLE 31.  
Frequency Distribution of  $\Delta R$  by Historical Pattern  
for 69 Country Group and Issue Pairs

| Pattern                  | Number<br>of<br>Cases | $\Delta R$ (24 months) |        |      |
|--------------------------|-----------------------|------------------------|--------|------|
|                          |                       | Low                    | Medium | High |
| 1. Stable                | 20                    | 12                     | 6      | 2    |
| 2. Moderate level change | 6                     | 2                      | 4      | 0    |
| 3. Moderately unstable   | 15                    | 8                      | 3      | 4    |
| 4. Major level change    | 11                    | 5                      | 6      | 0    |
| 5. Highly unstable       | 17                    | 5                      | 9      | 3    |
| TOTAL                    | 69                    | 32                     | 28     | 9    |

TABLE 32.  
 Percentage Distribution of  $\Delta R$  by Historical Pattern  
 for 69 Country Group and Issue Pairs

| Pattern                  | Percentage Distribution of $\Delta R$ |     |        |      |
|--------------------------|---------------------------------------|-----|--------|------|
|                          | Total                                 | Low | Medium | High |
| 1. Stable                | 100                                   | 60  | 30     | 10   |
| 2. Moderate level change | 100                                   | 33  | 67     | 0    |
| 3. Moderately unstable   | 100                                   | 53  | 20     | 27   |
| 4. Major level change    | 100                                   | 45  | 55     | 0    |
| 5. Highly unstable       | 100                                   | 29  | 53     | 18   |
| TOTAL                    | 100                                   | 46  | 41     | 13   |

---

How can the direction as well as the magnitude of change for R be forecast ?

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In previous experimentation with univariate time series, samples have not been sufficiently large to permit isolation of the direction of  $\Delta R$  by historical pattern. Forecasts based on  $\Delta R$  distributions, therefore, refer only to magnitudes of likely change.

It seems meaningful to assume that the likely direction of change in R would be associated to some degree with the base of R, i.e., that value from which the change is measured. It may be reasoned that since the range of R is scale constrained, i.e., R values may range only from +1.0 to -1.0, that at least for high positive and high negative base R values the direction of any change forecast would tend toward lesser values.

Since it would be desirable to test this supposition with the largest possible sample, the distribution of cases by base R values was developed for both Sample 1, the original experimental case sample for country pairs, and for Sample 2, the same country pair cases with extended  $\Delta R$  coverage (See Table 30). If these two distributions are similar then it is reasonable to use the larger Sample 2 to explore the direction of change.

Table 33 shows the frequency and percentage distributions of base R within the two samples. For this purpose the R scale is divided into five ranges which may be labelled subjectively as follows:

TABLE 33.  
Frequency and Percentage Distribution of Base R  
for Two Case Samples

| Base Value of R | Sample 1  |     | Sample 2  |     |
|-----------------|-----------|-----|-----------|-----|
|                 | Frequency | %   | Frequency | %   |
| + .61 to +1.00  | 7         | 9   | 50        | 8   |
| + .21 to + .60  | 23        | 31  | 190       | 30  |
| - .20 to + .20  | 19        | 26  | 144       | 23  |
| - .60 to - .21  | 11        | 15  | 110       | 18  |
| -1.00 to - .61  | 14        | 19  | 130       | 21  |
| TOTAL           | 74        | 100 | 624       | 100 |

| R =            | Country Pair is:    |
|----------------|---------------------|
| + .61 to +1.00 | mutually supportive |
| + .21 to + .60 | friendly            |
| - .20 to + .20 | neutral             |
| - .60 to - .21 | unfriendly          |
| -1.00 to - .61 | hostile             |

In Table 33 it can be seen that the percentage distributions of cases by base R are virtually identical for Samples 1 and 2. Therefore, we may employ Sample 2 to examine direction of change.

For each of the five base R ranges, Table 34 shows the distribution of the 624 cases of Sample 2 by direction of change for low, medium, and high  $\Delta R$ . For example, the data in the table may be read as follows: of all cases in Sample 2 with base R values between +.61 and +1.00 and with low  $\Delta R$  values,  $\Delta R$  was positive in 12 cases and negative in 16 cases. The table illustrates, therefore, the likelihood of positive and negative change for all combinations of base R and  $\Delta R$  across the entire sample.

For convenience in interpretation, these data are expressed in Table 35 as odds of positive versus negative change for all combinations of base R and  $\Delta R$ . For example, the data in Table 35 may be read as follows: for any case with a base R value between +.61 and +1.00 and with a low  $\Delta R$  value, the odds are 1.3 to 1 that  $\Delta R$  will be negative.

There is an interesting symmetry in Table 35 which bears out our earlier supposition. At all ranges of base R except the neutral range, the odds range from equal (1 to 1) to favoring change away from extreme R values and toward neutrality. Further, the larger is  $\Delta R$  the more pronounced is this phenomenon. Additionally, however, it should be noted that for neutral values of base R, the derived odds favor positive change for all values of  $\Delta R$ .

68.

TABLE 34.  
Distribution of the Direction and Magnitude of  $\Delta R$  by  
Base Value of R

| Base Value of R | Total Cases | $\Delta R$ (24 months) |          |              |              |       |       |
|-----------------|-------------|------------------------|----------|--------------|--------------|-------|-------|
|                 |             | Low                    |          | Medium       |              | High  |       |
|                 |             | 0 to +.2               | 0 to -.2 | +.21 to +.40 | -.21 to -.40 | >+.40 | >-.40 |
| + .61 to +1.00  | 50          | 12                     | 16       | 0            | 13           | 0     | 9     |
| + .21 to + .60  | 190         | 50                     | 50       | 30           | 35           | 5     | 20    |
| - .20 to + .20  | 144         | 28                     | 22       | 34           | 13           | 31    | 16    |
| - .60 to - .21  | 110         | 19                     | 18       | 18           | 17           | 32    | 6     |
| -1.00 to - .61  | 130         | 49                     | 42       | 15           | 7            | 17    | 0     |
| TOTAL           | 624         | 158                    | 148      | 97           | 85           | 85    | 51    |

TABLE 35  
Odds on the Direction of  $\Delta R$  by Base Value of R

| Base Value of R | $\Delta R$ (24 months) |          |               |              |       |      |
|-----------------|------------------------|----------|---------------|--------------|-------|------|
|                 | Low                    |          | Medium        |              | High  |      |
|                 | 0 to +.2               | 0 to -.2 | + .21 to +.40 | -.21 to -.40 | + .40 | -.40 |
| + .61 to +1.00  | 1                      | 1.3      | 0             | 1            | 0     | 1    |
| + .21 to + .60  | 1                      | 1        | 1             | 1.2          | 1     | 4    |
| - .20 to + .20  | 1.3                    | 1        | 2.6           | 1            | 1.9   | 1    |
| - .60 to - .21  | 1.1                    | 1        | 1.1           | 1            | 5.3   | 1    |
| -1.00 to - .61  | 1.2                    | 1        | 2.1           | 1            | 1     | 0    |

The odds on direction of  $\Delta R$  in Table 35 may be used in conjunction with the likely magnitudes of  $\Delta R$ , such as in Table 29, in the following way. Suppose a country pair for which a forecast of  $\Delta R$  is desired exhibits a Pattern 4 time series history (major level change). According to Table 29, the percentage (probabilistic) distribution of  $\Delta R$  is:

- Low = 50
- Medium = 29
- High = 21

Suppose further that the base value of  $R$  (in this example, the current value) is  $+0.35$ . For such a base  $R$  value the directional odds for each  $\Delta R$  range (from Table 35) are:

|          | <u>Positive</u> | <u>Negative</u> |
|----------|-----------------|-----------------|
| • Low    | 1               | 1               |
| • Medium | 1               | 1.2             |
| • High   | 1               | 4               |

It is proposed that the above two distributions may be combined by applying the directional odds in the second to divide the first between likelihoods of positive and negative changes as follows:

|          | <u>Positive</u>                  | <u>Negative</u>                    |
|----------|----------------------------------|------------------------------------|
| • Low    | $(50 \times \frac{1}{1}) = 25$   | $(50 \times \frac{1}{1}) = 25$     |
| • Medium | $(29 \times \frac{1}{2.2}) = 13$ | $(29 \times \frac{1.2}{2.2}) = 16$ |
| • High   | $(21 \times \frac{1}{5}) = 4$    | $(21 \times \frac{4}{5}) = 17$     |

This results in the following forecast distribution for the example case with its base value of +.35:

| <u>Forecast distribution</u> | <u>Forecast <math>\Delta R</math> range</u> | <u>Probability</u> |
|------------------------------|---------------------------------------------|--------------------|
| 1. high positive             | $>+.75$                                     | 4                  |
| 2. medium positive           | + .55 to + .75                              | 13                 |
| 3. low positive              | + .35 to + .55                              | 25                 |
| 4. low negative              | + .35 to + .15                              | 25                 |
| 5. medium negative           | + .15 to - .05                              | 16                 |
| 6. high negative             | $>-.05$                                     | 17                 |

In proposing forecast distributions of this nature, the assumption is always that such forecasts are useful only in the absence of other information, that is, as an alternative to uninformed guessing. When other information is available it should be used as alternative to or in conjunction with these techniques which solely reflect what has happened previously between pairs with analagous histories. In forthcoming validation experiments for forecasts based on these statistical analogies the primary criterion employed will be whether or not the forecasts are superior to a blind guess.

## STATUS - MULTIVARIATE CROSS SECTIONAL ANALYSIS

This section describes a preliminary design for the investigation of multivariate cross sectional analysis as a technique for forecasting short term crises, with particular emphasis on crises involving the use of military force.

### RATIONALE

Under the MDS concept, forecasting refers to the anticipation of behavior through the utilization of perspectives inherent in one or more event data sources. In a strict sense, then, this approach does not attempt to forecast behavior directly. When forecasts are constructed, one is instead quantifying an expectation about what one or more sources are likely to report in a particular forecast period. To the extent that such expectations are realized in subsequent reportage (that is, are valid), and to the extent that expectations about behavior generated from each source reflect the actual expectations of policy makers in the country on which the source reports, the utility of event data for measuring anticipation may well prove greater for the policy community than its utility for measuring important forms of behavior directly.

### METHOD

In the present multivariate forecasting efforts, expectational forecasts are derived from two types of historical analogues. First, historical precedents for individual country pairs are used to construct simple forecasting variables for each country pair of interest, on the assumption that specific historical patterns tend to be repetitive within pairs. Still other forecasting variables are constructed for each pair which attempt to measure the extent to which particular patterns are being repeated or repudiated in proximity to specific forecast

periods. This latter set of variables assumes that deviations from prior patterns tend to be incremental rather than radical in character. These variables are used to adjust each pair-wise forecast of event distributions for any variations from established patterns of interaction which occur immediately prior to the forecast period.

Secondly, for any group of country pairs for which forecasts are desired, the forecasting variables are rank-ordered and weighted to yield a single score for each pair in the group. This score is defined as the relative crisis-proneness (CP) for each pair for the period being forecast. The rank-ordering of pairs in terms of CP scores constitutes a simple typing of pairs in terms of composite historical profiles. In contrast to looking within each pair for historical precedents, this second method looks at pairs cross-sectionally over equal historical intervals to determine overall similarities, which are interpreted, in turn, as relative expectations about the onset of crisis involving military force during the forecast period.

#### DEPENDENT VARIABLES

Specifically, for each country pair in the forecast, two dependent variables are generated:

1. The expected distribution of friendly interaction for the forecast period, expressed as the percentage of total pairwise interaction expected in each of CACI's "unfriendly" event groups (i.e., groups 1,2,3)<sup>1</sup>; and
2. a crisis proneness score for each country pair by which a rank-ordering of country pairs from most crisis-prone to least crisis-prone is produced.

The emphasis on event distributions rather than event frequencies as one of the dependent variables is deliberate,

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<sup>1</sup> "Development and Experimental Application of Quantitative International Affairs Indicators", Interim Technical Report. Vol. II, Technical Appendices, September, 1971, CACI, Inc., p. 10-10a.

given the pitfalls of accurately forecasting the latter.<sup>2</sup> To the extent that the distribution of unfriendly events for any one country pair is more stable over time than the pattern of event frequencies within unfriendly event groups, percentage distribution would then seem the better choice of dependent variable especially since the distributions in turn contribute to rank of each country pair in terms of crisis proneness. To the extent that the expected distributions are in fact more stable predictors of actual distributions, the relative ordering of country pairs should be more accurate.

#### TIME SPAN TO BE FORECAST

The length of the period for which forecasts will be made is six months. While findings may permit meaningful forecasts to be constructed for shorter intervals of time, the emphasis on distribution of unfriendly events as a means of forecasting seems to require the use of an interval greater than one month to determine whether particular forecasts are reasonable. One month may not be sufficient, in other words, for the expected distributions to become manifest in the data, if indeed the forecasts are valid in terms of this criterion. Forecasts for intervals substantially greater than six months, on the other hand, may be of little value where expectations about near term futures are concerned. Given these factors and the exploratory nature of the forecasting variables defined below, a longer rather than shorter interval was selected.

In specifying the length of the forecast period, we have also specified the data interval necessary for validating the technique. A minimum of six months of data is required to generate each forecast, so for the NYT collection, postdiction

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<sup>2</sup>James A. Moore and Robert A. Young, "Some Preliminary Short-Term Predictions of International Interaction", Working Paper #1, World Event/Interaction Survey, September 1969, University of Southern California.

exercises are possible for any six-month period occurring between July, 1966 and the end of the collection. Similarly, TOL postdiction exercises are possible for any six-month period occurring between January, 1972 and June, 1974.

At minimum, the present study will prepare and evaluate forecasts for all non-overlapping six month periods beginning in July, 1966 for the NYT collection, and starting in January, 1972, for the TOL collection, with special attention to forecasts generated from different collections for identical periods.

#### FORECASTING VARIABLES

The variables used to construct forecasts in the present effort are divided into two classes:

- pattern variables, by which is meant those variables which summarize previous interactions between each country pair of interest; and
- adjustment variables, that is, those variables which express the variation from established patterns, if any, just prior to the forecast period so that the projected distributions of unfriendly behavior may be adjusted accordingly.

While each class of variable utilizes event data from previous time points to produce its forecasts, the historical intervals and underlying models differ for each. Pattern variables utilize one or more unfriendly event groups from the beginning of the collection through the data month preceding the forecast period. Pattern variables thus assume that, for any pair, a "perfect memory" of past interaction is important in generating expectations about future interaction. In contrast, adjustment variables emphasize the variation away from previously established patterns within one or more event groups over the six months immediately prior to the forecast period. Adjustment variables assume that, for any pair, recent historical

episodes are important in generating expectations to the extent that such episodes depart from long term "norms". For a given pair, forecasts are derived from both classes of variables, and each forecast can be validated separately. The present design thus affords the opportunity to compare a simple model of forecasting based on "perfect memory" with a second, competitive model based on "recent memory" in terms of their respective utility for forecasting.

The pattern variables which have been provisionally selected for use in constructing pair-wise forecasts are defined below:

- Negative event total,  $N$ , the sum of pair-wise interaction in event groups 1-3, for all time points prior to the forecast period;
- Weighted negative event total,  $N_W$ , the total pair-wise negative total where the assigned weights are 10, 5 and 1 for events falling into groups 1, 2 and 3, respectively, for all prior time points;
- Total events,  $E$ , the total pair-wise interaction (groups 1-7) for a given pair for all prior time points;
- Hostility Ratio,  $H$ , where for each pair,  

$$H = N/E;$$
- Weighted Hostility Ratio,  $H_W$ , where for each pair,  

$$H_W = N_W/E;$$
- Average distribution of unfriendly interactions,  $\bar{P}_i$ , for event groups 1, 2 and 3, averaged over the number of time points prior to the forecast period; and
- Overall distribution of unfriendly interactions,  $P_i$ , for event groups 1, 2 and 3, expressed as the total frequency of events in each group divided by the total number of events (groups 1-7) for all prior time points.

Of the preceding variables, the first five are designed to maximize distinctions between an arbitrary number of country pairs when the pairs are rank-ordered and a crisis proneness

score is calculated for each pair. The pairs which tend to rank highest on these variables will tend to achieve the highest CP scores for the forecast period.

The distribution variables will also be used to construct CP scores. However, such variables have additional functions. Average distribution for each of the unfriendly event groups is used in the construction of an adjustment variable as defined below. Overall distribution of events across groups 1, 2 and 3 represents the forecast generated for particular pairs of countries under the "perfect memory" model outlined above. The method of evaluating this expected distribution is described below under the heading of validation.

Adjustment variables are defined as follows:

- Adjusted, weighted, negative event total. This variable is defined as the sum of the weighted differences between the average point-to-point change in each of the negative event groups computed to within six months preceding the forecast period and the frequencies in each group observed during the six months preceding the forecast period. Weights for the differences between long term "average" change and short term actual frequencies are assigned in proximity to the beginning of the forecast period,  $t$ , where differences are weighted 1,2,3,...,6 at  $t-6$ ,  $t-5$ ,  $t-4$ , ...,  $t-1$ , respectively. This variable is designed to emphasize atypical variation in activity levels in each of the three event groups, weighted for importance by proximity to the beginning of the forecast period. Positive values for this variable indicate atypical increases in unfriendly activities, while negative values represent declining levels of unfriendly behavior in the six months preceding the forecast period. This variable is used in the construction of CP scores for each country pair in the forecast.
- Adjusted, overall distribution for each of the negative event groups. This variable is a function of average distribution, defined previously, and actual negative event group distributions for each pair in the six months preceding the forecast period. Its purpose is to evaluate variations in each negative distribution in

proximity to the forecast period and correct the long term distribution for important changes. The resulting distribution is interpreted as the "recent memory" forecast for a particular pair.

The exact construction of the preceding variables will be discussed in more detail in the final report.

#### VALIDATION

The forecasting variables described above will be computed for all possible non-overlapping six-month forecast periods for both the New York Times and Times of London collections. Selection of country pairs for inclusion in the study will be based on the level of activity of the pair, the previous conflict history of the pair, and upon other similar considerations.

The method of evaluating CP scores will be to compare the rank-orderings of country pairs from most crisis prone to least crisis prone in each forecast period with the rank orderings of the pairs on (1) actual level of military exchanges in the forecast period; and (2) actual level of negative interactions (groups 1,2 and 3 combined) for each forecast period. Spearman's R will be used to summarize the degree of agreement between expected ranks and observed ranks for each forecast period. The Z-test of significance will be applied to each rank correlation and evaluated. The overall performance of the CP score as a forecasting device will be evaluated.

In order to evaluate the two sets of forecasts for unfriendly event distributions, the following procedure will be used. It will be recalled that for each forecast period, two sets of expected negative event group distributions are produced, one set from the pattern variable "overall distribution", representing a perfect memory model of using history, the second set from the adjustment variable "adjusted, overall distribution",

which we have associated with a "recent memory" model for using history. To assess the extent to which the actual numbers agree, each set of expected distributions will be regressed against the actual negative event distributions for each forecast period. To the extent that the distributions coincide numerically, we should expect that the standard regression equation  $y = a + bx$  should yield values which closely approach zero for the intercept  $a$ , and values approximately equal to 1 for the slope of the regression line,  $b$ , for each individual distribution. The model which performs better across all forecast periods constructed will be adjudged superior. The models will be further evaluated where separate collections generate forecasts for identical time periods, and the implications for MDS analysis recorded.

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## FUTURE ACTIVITIES

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Remaining tasks in this project relating to short term forecasting include:

1. Validation of forecasts for the 1973-1974 period derived from univariate time series analysis,
2. Preparation and interpretation of a regional forecast based on univariate time series analysis.
3. Implementation and evaluation of the multivariate research design described herein, and
4. Preparation of a final research report.

APPENDIX A.

Multiple Data Stream Comparisons:  
A Literature Survey and Evaluation

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## INTRODUCTION

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Intersource comparison and multiple source analysis have been important means by which students of event data have explicated, summarized, and polemicized on the behavior of nations in the international arena. By comparing and suggesting combinations of various sources they have attempted to mitigate problems that have been associated with the use of single sources (i.e., national biases, limited coverage, unrepresentative data). Multiple source use is expected to increase the sheer volume of more comprehensive, less biased data. For purposes of analysis, multiple sources are expected to counter the ambiguities one tends to find in single sources, validate data by multiple observations, and provide a basis for more comprehensive and reliable conclusions on behavior in the international arena.

The general thrust of multiple data source research has been toward the objectives of increased comprehensiveness, validation of observations, and bias reduction. These objectives have been assumed to be desirable, i.e., it has been assumed that resulting combined data collections would more accurately represent the "true" state of international behavior and, under analysis, would more likely yield reliable insights into the future.

While we are sympathetic to such research objectives, we choose to pursue multiple source comparisons with a different strategy to enhance the same analytic goal. This strategy is one of treating the insufficiencies and parochialism of individual sources as purposeful and valuable. We assume that similarities and differences in the representation of international

behavior by different national sources offer a basis for understanding the similarities and differences in the interests and perspectives of different nations, as operationalized by their media. In this strategy, source incompleteness reflects priorities of attention and interests, and source bias reflects purposeful viewpoints. Instead of seeking the "true" state of international behavior, we will seek and compare perceived states of behavior as reported by different media. We term this approach multiple data stream research.

In order to develop techniques through which international behavior as represented in multiple media can be analyzed, summarized and used in the forecasting of defense related phenomena, it is wise to take advantage of lessons learned about the problems existing in the use of such sources. Therefore we have undertaken a survey of the existing literature on multi-source comparisons. In this paper, we seek to document the major thrust of such studies, their principle methods and conclusions, and to determine the significance of their findings to our pending analysis.

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## PURPOSES OF STUDIES; CHARACTERISTICS OF INTERACTION DATA

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The purposes of analyzing event interaction data as it is gleaned from multiple sources are varied: to assess the effects of differential coverage on political conclusions of analyses;<sup>1,2,3</sup> to compare the attention of different sources to particular arenas, conflicts, and nations;<sup>5,6,7,8</sup> to compare coverage of wars between two nations by multiple sources;<sup>4</sup> to discover whether one gains more information on international behavior from using more than one source and, along these lines, to analyze whether more information necessarily means more representative information and thus more reliable conclusions. The papers surveyed in the literature on multiple source comparisons seek to answer these and other questions.

Before reviewing these papers, however, it is important to review the notion of event-interactions, to suggest how this notion may vary with different kinds of sources, and how this variation may affect multiple source comparisons and analyses.

Event interaction data reflect the flow of actions and responses (or behavior) between nations. Based on the assumption that there are, as McClelland holds,<sup>\*</sup> "continuities and regularities in the international political behaviors of nations..." one must study this behavior in the international system in order to enable one to predict behavior.

McClelland differentiates between event interactions and other international actions and responses, termed transactions. The

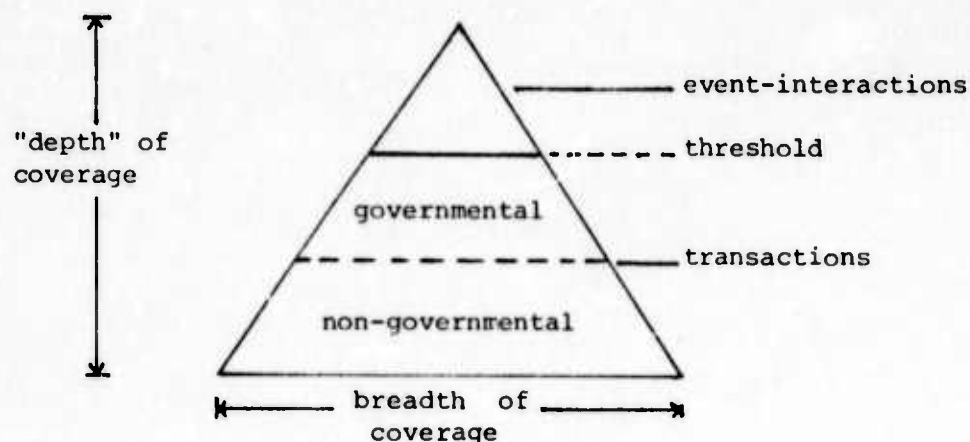
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<sup>\*</sup> McClelland and Hoggard, "Conflict Patterns in the Interactions Among Nations," USC. 1968 July memo.

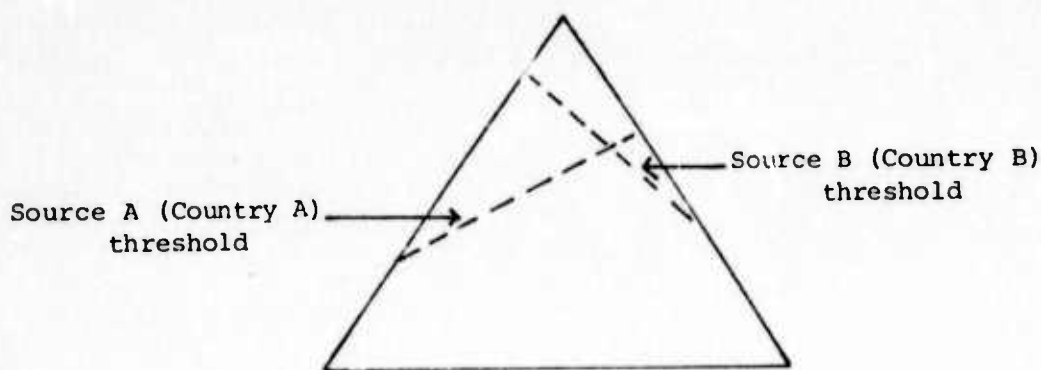
distinction is two-fold. Event-interactions are sufficiently unusual and/or important enough so that they tend to be dealt with outside normally established international channels. They are, as a result, newsworthy, and tend, when publicly disclosed, to be reported by news media. Interactions can be classified in various ways, i.e., in terms of types (threats, visits, comments) or behavior groups (hostile, friendly, neutral), but they are always of such magnitude and intensity as to evoke official responses of a non-routine nature and disclosure through media reporting.

Transactions, on the other hand, are of a routine character. They do not warrant unusual international and governmental attention; nor do they tend to be given attention by news media. Such routine transactions include regular diplomatic notes and messages, and daily memoranda sent back and forth between embassies. They also include most international non-governmental communication involving private citizens, business organizations, etc.

The diagram which follows attempts to illustrate the above distinctions.



Let the entire triangle represent the universe of international actions and responses. Event-interactions constitute one part of the universe (probably the smaller part) and transactions the balance. It is important to note that the threshold separating interactions from transactions is somewhat arbitrary and may vary from source to source as a function of editorial policy. For example, in serving their constituencies, international financial media will tend to report international economic news in greater "depth" than will conventional international newspapers. The latter, in turn, may well provide deeper coverage of international political news. Similarly, media of recognized global scope, such as the New York Times, will tend to report news in greater "breadth" (cover more countries) than will more "provincial" media, such as the Middle East Journal. Finally, it is characteristic of most if not all national sources to "tilt" the threshold (introduce biases in world-wide news coverage), in accord with their own prioritized interests coupled with those of their national constituencies. This characteristic is illustrated below.



In undertaking multiple source comparison, then, especially with the possible objective of combining sources, attention ought to be paid to the characteristics and purposes of the alternative sources. It should also be recognized that the true dimensions and characteristics of the universe of event-interactions has not yet been established. Therefore, dangers exist in assuming either that single sources represent "good" samples of reality or that combined sources are necessarily "improved" samples.

Fortunately, these same conditions and reservations need not apply to the strategy of treating separate sources as representative of distinct points of view. That strategy, in fact, is designed to exploit the informational advantage such source "imperfections" offer.

One of the objectives of using multiple sources is to increase the amount of data available for analysis. But a key question is the location of data in the above diagrams. As will be seen in the examination of the various studies, some sources were found to contain greater amounts of transactional data than others, which resulted in higher data yields. Here the question is "are the additional data valuable and comparable, and for what purposes"? For example, Hoggard's comparison of the Foreign Relations Indicator Project (FRIP) and the New York Times (NYT)<sup>9</sup> resulted in the finding that FRIP data are of a routine transactional nature, and therefore are not comparable with the interactional data found in the NYT. In fact, Hoggard found the frequency ratio of data in FRIP to NYT to be 20:1.<sup>9</sup> *ibid*

In Doran's study of regional vs. global sources<sup>2</sup>, he finds that the regional sources have a greater number of events reported--but that most of the increase is transactional rather

than interactional. When interactions occur they are more likely to be picked up by the global source. It can be held, then, that his use of regional sources lowered the threshold in our diagram.

The Moore<sup>6</sup> comparison of Foreign Broadcast Information Service (FBIS) and the NYT finds much routine data in FBIS, but nevertheless finds that profitable and meaningful analyses can be made as long as one is aware of the existence of such routine data. The same holds true for Smith's<sup>4</sup> findings using the Indian White Papers--they too include much data on routine diplomatic exchanges yet analysis of the data results in findings that are both interesting and valuable.

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## SURVEY OF LITERATURE ON MULTI-SOURCE COMPARISONS

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This survey covers nine papers which report on studies of multiple event data sources for a variety of research purposes. The studies and their principle findings are summarized in this section. The concluding section of this paper evaluates the implications of these findings for the strategy to be employed in our multiple data stream research.

Edward Azar, with Thomas Jukam, James McCormick and Stanley Cohen,<sup>7</sup> compared eight sources of interaction data. They chose two time period samples consisting of January, May and September of 1956 and 1957, and limited their attention to Egypt (UAR) as the actor. They later expanded the study to a four-year analysis using the same methods of comparison, with Egypt and Israel as actors. The eight sources used included four American, two British, one Russian and one Swiss, the choices being based on the proposition that this range of sources would more adequately reflect events since they represented several international arenas. In the preliminary study, Azar collected all interaction data on UAR as an actor, and scaled the events on a five-region scale of violence. The scale ranged from very low violence (e.g., a nation's legislature voting funds to support an international military organization) to very high violence (e.g., Nation A launching an offensive against Nation B).

The findings in the preliminary study, (which are based on a total of 147 events collected with UAR as initiator and rated on the violence scale scale) noted that the Middle East Journal (MEJ) and the New York Times Index (NYTI) reported nearly 70% of all the events collected (90% in the four year study). Concentrating

his analysis on these two basic sources, Azar produced two interesting results. First, even though together they account for 70% of all data reported, joint reporting by the two (events that are covered by both) represents only 10.9% of the total (9.7% in the four-year study). Second, the NYTI reported nearly twice as many events as the MEJ.

There are several conclusions that Azar draws from this study. An obvious one is that due to the low overlap in events covered by both sources, the number of events would have been less had the study used only one source. Azar warns that reliance on one source could yield different conclusions than an analysis using both. Here he cites his finding that the NYTI reported more violent events than the MEJ; thus, if one were to use only the NYTI, the resulting analysis would give a different picture of UAR's behavior as an actor than if one were to use both sources.

Both the preliminary study and the four-year study lead Azar to warn against utilization of a single source, especially for area studies, and to emphasize that to get a more comprehensive view of UAR as an actor one needs to use at least the two basic sources studied here. He feels that reliance on a single source could generate dissimilar conclusions about UAR's behavior to other nations, and would eliminate a substantial number of events that could be of theoretical and empirical importance in analyses of the data.<sup>7</sup>

Also focusing his attention on the Middle East arena is Robert Burrowes,<sup>3</sup> study comparing nine sources, among which are the New York Times (NYT), New York Times Index (NYTI), Times of London (TOL), Deadline Data and Cahiers, with Syria, Jordan,

Israel and Egypt as actors. His time sample consists of four two month periods (January-February 1955, 1956, 1962 and 1967) chosen because they represent two periods of relative calm and low activity and two periods of high conflict and activity. Burrowes seeks to answer questions such as the following:

(1) What single source produces the largest yield of events? (Cahiers de l'Orient Contemporain) (2) What combination of sources produces the largest yield of data and with the least duplication? (Cahiers and NYTI)

Another important question Burrowes is concerned with has great significance for those planning the use of multiple sources: Do sources differ qualitatively in terms of the types of events, actors, and targets they report? Do they yield different interpretations of the "real" world? His finding is that they do. Selective attention results in a source paying close attention to events involving one nation than other nations--i.e., if Cahiers and NYT had been equally attentive to each of the four actor nations, each source would have yielded a similar percentage of total actions for each nation. However, this is not the case. Cahiers noticeably over-reported on Syria, which happens to be a former French Mandate, and under-reported on Israel because Cahiers doesn't recognize the existence of Israel as a state. (The small number of events on ISR reported by Cahiers were found under the heading "Arab-Israel Relations"). On the other hand, the NYT relatively over-reported actions by Israel. Another difference found in reporting by targets is that actors in the NYT, TOL and Cahiers targeted a disproportionately large number of events to the U.S., Britain and France, respectively (e.g., events targeted to Britain made up 60% of all events targeted in TOL to either the U.S. Britain or France).

Burrowes concludes that the analyst is best advised to use multiple sources in the hope that their combined yields will

produce a more accurate composite analysis. However, he sees no assurances that this method will result in combining the strengths rather than the weaknesses of the chosen sources. He also concludes (as do Doran et al.<sup>2</sup>) that "...sources which vary greatly in the "mix" or distribution of the events they report will produce different results; such sources are obviously not yielding equally representative samples of the unknown universe of external behavior."<sup>3</sup>

A study designed to compare global vs. regional data sources was made by Charles Doran, Robert Pendley and George Antunes. Its purpose is to discover whether political conclusions are dependent upon the nature of the sources from which the data have been derived.<sup>2</sup> Doran sets out to challenge what he feels is other data collectors' contention that variation in interaction data derived from different sources will have no effect on political conclusions emanating from such data. To Doran the issues in the studies of multiple source comparability are as follows: Is information concerning international events reliable across sources? How serious is the disparity between the data drawn from two kinds of sources? Which data source is the most reliable?

In this study Doran collected data from the Hispanic American Report and the Spanish journals Tiempo (Mexico City) and Vision (Panama). These are all regional sources. He compared these data with the Feierabend study on political instability which used the global sources Deadline Data and Yearbook of the Encyclopedia Britannica.\* The comparison of the two data sets included examination of relative distributions of events, outlining characteristics within and between the sets, as well as comparing absolute disparities between them in order to determine whether any disabling bias is present.

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\* Feierabend, I.K. and R.L., 1966-- "Aggressive Behavior Within Politics, 1948-1962: A Cross-National Study." Journal of Conflict Resolution. 10 (Sept) 149-179.

In the comparison of event distribution over time, Doran found some agreement between the two studies concerning the general nature of instability over time. However, since he found that the regional press reported a significantly larger number of events, Doran hypothesizes that such a disparity suggests that the globally oriented press "may be sporadically sensitive to instability events in a given region focusing attention on a country or region when events of (special) significance occur."<sup>2</sup> Then, turning elsewhere, the global sources leave it to the regional sources to report the more day to day developments. One might mention here that Doran's data derived from regional sources could be said to fall within the McClelland definition of more "routine" or "transactional" data. When these transactional data take on the characteristics of interaction data, they are then picked up by the global sources.

The conclusions of the Doran study sustain other analyst's assertions that disparities between two sources and the use of only one can result in different findings. He agrees with Burrowes' assertion that sources which vary in distribution of events will necessarily produce different results since they are obviously not yielding equally representative samples of external behavior. However, Doran does not judge one source to be more desirable or more reliable than another. Even though he holds that there is "considerable empirical evidence sustaining the greater reliability of regional sources,"<sup>2</sup> this does not discredit the use of global source in certain cases for designated and specific purposes. He does urge that before embarking on the use of different sources in a study of their reliability, the analyst systemically compare event distributions to discover whether biases or inaccuracies exist. Once such variables are recognized and taken into account, the analyst can use multiple sources to gain a more comprehensive and broader view of the international system.

Raymond Smith's comparison of the New York Times (NYT) and the Indian White Papers (IWP)<sup>4</sup> as sources covering the Sino-Indian border conflict in 1962 concludes that, despite major differences between the two sources, they are both valuable indicators of behavior in this case. Basically using the WEIS system for interactions coding, Smith uses the data to prove five propositions set forth by Galtung. These propositions present a "partial explanation of the selection process that intervenes between the actual occurrence of world events"<sup>4</sup> and their resulting images that appear in the media.

The papers discussed previously generally conclude that relying on one data source can be misleading and unreliable, and that using several sources has drawbacks and difficulties because different sources can result in different conclusions. These studies hold that one should consider combining sources to increase comprehensiveness but view the results with caution. Doran does point out that different types of sources (i.e., global vs. regional) can be used for different purposes, but it is Smith who is the first to emphasize that it may be valuable to exploit these differences--that two sources may be variant but that both can be good indicators of behavior in different ways.

Specifically, in Smith's study the NYT is found to give more attention to American interests in the Sino-Indian conflict while the IWP clearly reflect Indian bias and propaganda. According to Smith one would expect the NYT to report more aggressive actions initiated by China than by India. Not only do the data bear this out, but the NYT reports China as having committed more aggressive acts overall than even India accused her of committing in the IWP. Moreover, the NYT reports that China initiated the border war, while the IWP report that India started it.

Smith emphasizes these differences between the two sources-- including that the IWP contain diplomatic notes and reports that are clearly included for propanganda purposes and reflect Indian bias.<sup>4</sup> What is important to note is that he views the differences as characteristics the analyst can use to his benefit as long as these characteristics are duly noted and taken into account for analysis. Thus, both sources are good indicators of behavior over time--and the resulting analyses, although they may vary, may include information on behavior that can be valuable. The NYT, then, with less events than IWP, may be more representative of a consistent reporting style given that its focus of attention may reflect American interests. And the IWP, even though as a source it is clearly biased in favor of India, can still serve as a good indicator of behavior as it did in this study of the Sino-Indian border conflict.

Two studies compared the New York Times (NYT) and the Times of London (TOL) as sources for event interaction data. The first is a preliminary three month study by Charles McClelland and Robert Young<sup>8</sup> of the WEIS Project. This study was undertaken to attempt to discover whether the gains in data from multiple sources would result in more reliable and/or in more complete information.

The data employed by McClelland and Young was for the time sample of July, August and September 1969. The comparisons included: acts initiated by 10 nations across behavior types; event frequencies reported in chosen geographic regions; 60 most active nations by seven general categories in incoming and outgoing event frequencies; and recorded acts by various conflict arenas. The study also included correlations of event data totals.

McClelland and Young's general conclusion is that data from both sources are derived from the same universe--the two sources give reports about the same world of events. However, the data are not redundant. Rather, it was found that the data are substantially alike structurally but reflect different source emphases on regions and conflict arenas. For example, reporting of violence was found to be patterned almost identically in both the NYT and TOL. But when the sources were analyzed for attention to specific geographic regions, the TOL was found, for example, to report more events on Africa and Western Europe than the NYT. The findings also show that each source focused attention on different conflicts: the NYT reported twice as many events on the Arab-Israeli conflict than did the TOL and three times as many on the Vietnam conflict, while the TOL reported more events on the Sino-Soviet relationship than did the NYT and five times as many events on the Nigeria-Biafra war.

Such conclusions bring to mind the lessons to be learned from Smith's study--that such differences in statistical distributions of data do not negate the value of alternative sources. Rather, these different findings reveal salient and exploitable characteristics about the two sources. The pertinence of this is that multiple sources can and should be utilized for delineating similarities and differences in perceptions of behavior and that indeed this attribute may be beneficial for future analyses.

A more complete study comparing the NYT and TOL was completed in 1972 at the WEIS Project. Gary Hill and Peter Fenn<sup>5</sup> used these two sources to again compare attention directed to chosen arenas of interaction and expanded it to explore attention to specific episodes of conflict in international affairs (i.e., the conflict between India and Pakistan, the relationship of Jordan to the Palestinian Liberation Organization (PLO), the

Middle East situation and the conflict in Vietnam). The time sample used in this study was January 1, 1969 to December 31, 1971. The methods were along the same lines as those in the McClelland and Young study.

Hill and Fenn found that the data from both sources form similar patterns when compared over time. Absolute amounts of reported events differ, but patterns of escalation and de-escalation and crisis periods are clearly distinguishable in both (although the NYT reports significant peaks in crises more extensively than the TOL). The authors found no evidence of a consistent bias across the two sources--the NYT did not view Pakistan as more hostile to India than the TOL viewed this, or vice versa. Thus the study concludes that event data as found in the NYT and TOL is essentially conflict-indicator data which are of a consistent and comparable nature, particularly when the data are of a conflict orientation.

A study comparing the New York Times (NYT) and the Foreign Broadcast Information Service (FBIS) was undertaken by Vivian Moore, James Moore, Barbara Hughes, and Don Kryszakowski.<sup>6</sup> The purpose of the comparison was to study the behavior of Japan in 1972 as reported by the two sources.\* The methods of analysis used--comparisons of distributions, frequencies, etc.--are based on data coded according to the WEIS procedures.

The findings from the analyses include the following. The frequency of events across behavior categories in the FBIS is much larger than in the NYT. (Recalling the McClelland distinction between interactions and transactions, however, one must point out that a substantial portion of the higher FBIS

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\* It should be noted that FBIS is itself a composite report of multiple newspaper and broadcast sources and is therefore not a unique "primary" source in the same sense as, for example, the NYT.

frequencies are accounted for by inclusion of more "routine" events. The authors also found that FBIS records Japan as interacting with more targets than the NYT and with a somewhat more even emphasis across target nations. They find that a problem exists in the comparability of these two sources because FBIS yields a much greater number of events than the NYT.

Independent of the higher transactional content of FBIS data, it was found that with respect to Japan's focus of attention different conclusions are produced by the two sources. For example, FBIS finds Japan focusing most attention (44%) on Asia; and within Asia most interaction is with countries which have Communist regimes. But the same analysis with the NYT as a source finds Japan focusing most attention on the U.S (42%) with Asia second (34.9%). However, both sources do show an emphasis of Japan's attention with Communist nations. Here one must remember our assertion (and that of Smith's<sup>4</sup> and others) that such differences need not nullify the findings nor discourage use of data sets. Rather, such differences, and similarities as well, can and should be utilized for specific purposes as long as the inherent characteristics of the two sources are duly noted and taken into account.

Another conclusion (and one which is also found in the study by Smith<sup>4</sup>) is that to gain a more complete view of international relations requires integration of data from an international source (NYT) and a regional source (FBIS). It is held that sources within a region may develop a data base which permits more sensitive indicators to perceive minor activities preceding important changes which tend to be picked up later by global sources. See also the Doran study<sup>2</sup> for a supporting view of the value of global and regional sources.

The study also compared three dyads of which Japan was a part (Japan and the U.S., Japan and the Soviet Union, and Japan

and the Peoples Republic of China) using the indicators of policy style and relations.\* The conclusions of these comparisons hold that the policy style and relations indicator values derived from FBIS are more positive than the same measures based on the NYT, due in part to the higher transactional event content of FBIS. It was also found that the values of these indicators over time were generally more stable (had less variance) when based on FBIS data than on NYT data.

Gary Hoggard's study comparing the New York Times (NYT) with the Foreign Relations Indicator Project of the State Department (FRIP)<sup>9</sup> found the two sources generally non-comparable because FRIP contains large amounts of transactional data. The project data file is based on communiques between the State Department and its officials in seven countries, most of which do not appear to be of great interest to American newspapers (e.g., Afghanistan, Bulgaria, Norway). These two factors assure that NYT derived data are not only under-reported but are likely inadequate for analysis. Thus Hoggard finds the event yield in FRIP overwhelmingly larger than in the NYT (1046:12 for seven nations). However, he uses this discrepancy to point out that FRIP-type sources enable one to study action-response sequences because of the frequent and detailed interactions such sources provide, while, on the other hand, it is difficult to find such continuity using public media data in regions and for countries which such media tend to ignore.

Hoggard's analysis of differential source coverage<sup>1</sup> using the New York Times Index, the Asian Recorder, Deadline Data on World Affairs, and the Indian White Papers to study the 1962 Sino-Indian border war is a more comprehensive comparison

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\* Theodore Rubin, "International Affairs Indicators for Defense Decision-Making". January 1973, CACI

yielding salient results that sustain the conclusions of other multiple source comparisons. His purpose was to assess the effects differential source coverage may have on conclusions drawn from the analysis of interaction data over a 14-month time period.

Hoggard finds evidence that the sources yield different quantities of interaction data, and that few of the same events were reported across sources. When compared over time, the data showed little or no correspondence among the different sources. (For a similar analysis, see Smith's<sup>4</sup> paper). Some of these findings are extreme, but may be attributable to the vastly different sources being compared. For example, 23.9% of the data appears in more than one source but only .5% (or 10 events) appears in all four sources. Also, 65.3% of the events reported in the NYTI appear only there, and other sources report from 12.1% to 15.9% of the NYTI data. Hoggard's findings about the IWP substantiate those of Smith.<sup>4</sup> Noting that IWP contain diplomatic papers which record routine events, he finds that it is this source that has the highest percentage of events unique to it.

Hoggard makes two other points about his sources: first, that in his estimation Deadline Data is a poor source since the data it yielded accounted for only 2.4% of the total; and second, that the NYTI and the Asian Recorder are more complete sources since their reporting accounted for 71.4% of the total interactions yielded.

The study finds that reporting of the same events across these sources is a small proportion of the total interaction reported, and that a comparison over time yields little or no correspondence among the sources. This indicates to Hoggard that for a complete analysis one needs to use as many sources as possible thereby acquiring a greater amount of interaction data and insuring a larger basis for analysis.

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## IMPLICATIONS OF RESEARCH FINDINGS

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This survey has been fruitful in identifying considerations which should be paramount in the approach to, analysis of, and interpretation of findings from multiple sources of event data.

The two most basic considerations relate to (1) the inherent characteristics of alternative sources, and (2) the purposes to which data are to be applied. It is clear that "event" data may be, and have been, derived from many types of sources--from newspaper to White Papers, from digests and journals to diplomatic communications. Each of these source types tends to define "events" differently. While all sources report interactions, some are devoid of transactional events while others include, and indeed even emphasize such events. Furthermore, source types differ significantly, with regard to the global vs. regional dimensions of coverage and emphasis.

With regard to purpose, it is clear that the "goodness" of a data source can and should be evaluated only in terms of the intended uses of the data. If primary interest lies in maximizing the amount of data for research and analysis, then different conclusions are in order with regard to source choices and combinations than if interest lies in exploiting the existing differences between "pure" or unadulterated sources. The major difference in data quality implied by these two classes of use is as follows: Enhancing data quantity through the use of multiple sources and/or the inclusion of transactional data introduces uncertainties with regard to data quality, as in such areas as comparability, sample bias, and reliability. These uncertainties may easily confound interpretation of some

analyses, and may invalidate others entirely. Using sources in their pure form avoids the introduction of such possible pitfalls.

In the forthcoming multiple data stream research, comparative analysis will be restricted to two sources of the same type, specifically the daily New York Times and the Times of London. Both of these, of course, are leading globally oriented newspaper sources indigenous to primary Western countries. The research will explore the similarities and differences in the perceptions of international behavior that these two sources report, and will have as its purpose the identification of international behaviors which are prioritized and evaluated differently by the two sources.

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APPENDIX B.

Definition and Measurement of the Relations  
and Policy Style Indicators

## APPENDIX B.

### Definition and Measurement of the Relations and Policy Style Indicators

Relations and Policy Style are indicators of the quality of international interaction. Interaction between a country pair may range from friendly to unfriendly over time, as it consists of a mix of positive, negative and neutral actions. The Relations indicator is defined as the friendly to unfriendly quality of actions flowing between a country pair in both directions (i.e., actions from A to B and actions from B to A). Policy Style is defined as the friendly to unfriendly quality of actions flowing from one country to another (i.e., actions from A to B).

Relations and policy Style are measured by the particular mix of positive, negative and neutral actions between a pair as reported by the data source. Values of Relations and Policy Style are obtained by the function:

$$R, \text{ or } S = \frac{p - n}{p + n + \frac{ne}{2}}$$

where:

R = Relations

S = Policy Style

p = frequency of positive actions reported, in both directions for R, or in one direction for S.

n = frequency of negative actions reported, in both directions for R, or in one direction for S.

ne = frequency of neutral actions reported, in both directions for R, or in one direction for S (neutral actions are accorded one-half weight in measuring R and S).

The values of this function range from +1.0 to -1.0. A plus value of R or S indicates that positive actions exceed negative actions, and therefore, that R or S is friendly; a minus value of R or S indicates the opposite. The magnitude of the plus or minus values of R or S indicates the degree to which Relations or Policy Style are positive or negative, respectively (i.e., how friendly or how unfriendly).

APPENDIX C.

Alphabetical List of Country and  
Organizational Names, with Abbreviations

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# APPENDIX C.

## Alphabetical List of Country and Organizational Names, with Abbreviations

| <u>COUNTRY</u>                 | <u>ABBR.</u> | <u>COUNTRY</u>         | <u>ABBR.</u> |
|--------------------------------|--------------|------------------------|--------------|
| Afghanistan                    | AFG          | Dahomey                | DAH          |
| Albania                        | ALB          | Denmark                | DEN          |
| Algeria                        | ALG          | Dominican Republic     | DOM          |
| Andorra                        | AND          |                        |              |
| Angola                         | ANG          | Ecuador                | EDU          |
| Argentina                      | ARG          | Egypt                  | EGY          |
| Australia                      | AUL          | El Salvador            | ELS          |
| Austria                        | AUS          | Equitorial Guinea      | GUE          |
|                                |              | (includes Fernando Po) |              |
| Bahrain                        | BAH          | Ethiopia               | ETH          |
| Bangladesh                     | BGD          |                        |              |
| Barbados                       | BAR          | Finland                | FIN          |
| Belgium                        | BEL          | France                 | FRN          |
| Berlin/East                    | EBA          | Fiji                   | FIJ          |
| Berlin/West                    | WBE          |                        |              |
| Bhutan                         | BHU          | Gabon                  | GAB          |
| Bolivia                        | BOL          | Gambia                 | GAM          |
| Botswana                       | BOT          | Germany/Dem. Rep.      | GME          |
| Brazil                         | BRA          | Germany/Fed. Rep.      | GMW          |
| Bulgaria                       | BUL          | Ghana                  | GHA          |
| Burma                          | BUR          | Greece                 | GRC          |
| Burundi                        | BUI          | Greneda                | GRE          |
|                                |              | Guatemala              | GUA          |
| Cambodia                       | CAM          | Guinea                 | GUI          |
| Cameroun                       | CAO          | Guinea-Bissau          | GBI          |
| Canada                         | CAN          | Guyana                 | GUY          |
| Central African<br>Republic    | CEN          |                        |              |
| Chad                           | CHA          | Haiti                  | HAI          |
| Chile                          | CHL          | Honduras               | HON          |
| China, People's<br>Republic of | CHN          | Hungary                | HUN          |
| China, Republic of             | CHT          |                        |              |
| Columbia                       | COL          | Iceland                | ICE          |
| Congo                          | COP          | India                  | IND          |
| (Brassaville)                  |              | Indonesia              | INS          |
| Congo                          | ZAI          | Iran                   | IRN          |
| Costa Rica                     | COS          | Iraq                   | IRQ          |
| Cuba                           | CUB          | Ireland                | IRE          |
| Cyprus                         | CYP          | Israel                 | ISR          |
| Czechoslovakia                 | CZE          | Italy                  | ITA          |
|                                |              | Ivory Coast            | IVO          |

| <u>COUNTRY</u>   | <u>ABBR.</u> | <u>COUNTRY</u>                   | <u>ABBR.</u> |
|------------------|--------------|----------------------------------|--------------|
| Jamaica          | JAM          | Rhodesia                         | RHO          |
| Japan            | JAP          | Rumania                          | RUM          |
| Jordon           | JOR          | Rwanda                           | RWA          |
| Kenya            | KEN          | San Marino                       | SAN          |
| Korea/North      | KON          | Saudi Arabia                     | SAU          |
| Korea/South      | KOS          | Senegal                          | SEN          |
| Kuwait           | KUW          | Sierra Leone                     | SIE          |
| Laos             | LAO          | Singapore                        | SIN          |
| Lebanon          | LEB          | Somalia                          | SOM          |
| Lesotho          | LES          | South Africa                     | SAF          |
| Liberia          | LIB          | South Yemen                      | SYE          |
| Libya            | LBY          | Spain                            | SPN          |
| Liechtenstein    | LIC          | Sri Lanka (Ceylon)               | SRI          |
| Luxemburg        | LUX          | Sudan                            | SUD          |
| Malagasy         | MAG          | Swaziland                        | SWA          |
| Malawi           | MAW          | Sweden                           | S'WD         |
| Malaysia         | MAL          | Switzerland                      | SWZ          |
| Maldiv           | MAD          | Syria                            | SYR          |
| Mali             | MLI          | Tanzania                         | TAZ          |
| Malta            | MLT          | Thailand                         | TAI          |
| Mauritius        | MAR          | Togo                             | TOG          |
| Mauritania       | MAU          | Trinidad-Tobago                  | TRI          |
| Mexico           | MEX          | Tunisia                          | TUN          |
| Monaco           | MOC          | Turkey                           | TUR          |
| Mongolia         | MON          | Uganda                           | UGA          |
| Morocco          | MOR          | USSR                             | USR          |
| Mozambique       | MOZ          | United Arab Emirates             | UAE          |
| Muscat and Oman  | MOM          | United Kingdom                   | UNK          |
| Nauru            | NAU          | USA                              | USA          |
| Nepal            | NEP          | Upper Volta                      | UPP          |
| Netherlands      | NTH          | Uruguay                          | URU          |
| New Zealand      | NEW          | Vatican                          | VAT          |
| Nicaragua        | NIC          | Venezuela                        | VEN          |
| Niger            | NIR          | Vietnam/North                    | VTN          |
| Nigeria          | NIG          | Vietnam/South                    | VTS          |
| Norway           | NOR          | Western Samoa                    | WSM          |
| Pakistan         | PAK          | Yemen                            | YEM          |
| Panama           | PAN          | Yugoslavia                       | YUG          |
| Papua New Guinea | PNG          | Zambia                           | SAM          |
| Paraguay         | PAR          |                                  |              |
| Peru             | PER          |                                  |              |
| Philippines      | PHI          |                                  |              |
| Poland           | POL          |                                  |              |
| Portugal         | POR          |                                  |              |
| Qatar            | QAT          |                                  |              |
|                  |              | <u>Colonies or Protectorates</u> |              |
|                  |              | Bahamas (BR.)                    | BAS          |
|                  |              | Bermuda (BR.)                    | BER          |

| <u>COUNTRY</u>   | <u>ABBR.</u> |
|------------------|--------------|
| British Honduras | BHO          |
| French Guiana    | FGU          |
| Hong Kong        | HOK          |
| Macao (Portugal) | MAC          |
| Southwest Africa | SAW          |
| Spanish Sahara   | SPS          |

International Organizations or Multilateral Groups of Nations

|                                            |     |
|--------------------------------------------|-----|
| Alliance for Progress                      | AFP |
| Organization of American States            | CAS |
| Irish Republic Army                        | IRA |
| Warsaw Pact                                | WAR |
| North Atlantic Treaty Organization (NATO)  | NAT |
| European Economic Community                | EEC |
| European Free Trade Association            | EFT |
| United Nations (only)                      | UNO |
| Organization for African Unity             | OAU |
| Kurds                                      | KUR |
| Palestine Liberation Organization          | PLO |
| Arab League                                | ARL |
| Vietcong                                   | VCG |
| World Bank (IBRD, IDA)                     | WBK |
| International Monetary Fund                | IMF |
| International terrorist groups             | TER |
| Southeast Asia Treaty Organization (SEATO) | SEA |
| International Red Cross                    | IRC |
| All other international organizations      | INT |
| Any other multilateral group               | MLG |
| Not stated, unidentified target            | NSC |