Estimating
Students' Final Scores

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INTRODUCTION

Suppose that a group of students is given three tests during a course and a test at the end of the course. Let Y_1, Y_2, Y_3 denote a student' scores in an ascending order based on first three tests, and Y_4 as his score in the last test; $0 \leq Y_i \leq 100$, $i = 1, 2, 3, 4$. A lenient teacher may ignore the student's worst test, and award him the final score

$$y = w(Y_2 + Y_3) + (1 - 2w)Y_4, \qquad (1.1)$$

w being the test-weightage, $0 < w < 1/2$, $0 \leq y \leq 100$. If the teacher has no information on the result of a student for one of first three tests, he attempts to estimate the final score y usually by one of following procedures.

$$\hat{Z}_1 = 2w \text{ (maximum of available scores)} + (1 - 2w) Y_4, \qquad (1.2)$$

$$\hat{Z}_2 = \frac{1}{1-w} [w \text{ (maximum of available scores)} + (1 - 2w) Y_4], \qquad (1.3)$$

$$\hat{Z}_3 = w \text{ (sum of available scores)} + (1 - 2w) Y_4, \qquad (1.4)$$

the available scores may be (Y_1, Y_2), or (Y_2, Y_3), or (Y_1, Y_3). This paper makes a comparative study of these procedures under various conditions pertaining to probability of missing the student's best score Y_3. A proposal is also given for a more satisfactory estimate of the final score.

ASSUMPTIONS

Restricting our concern to a student for whom the teacher has no information on one of his first three results, we assume that the teacher can associate a probability p_j that the student's missing score takes jth position in ascending order of his three scores, that is, it is Y_j; $j = 1,2,3$. The situation $p_1 = p_2 = p_3 = 1/3$ is then the one where the teacher is not sure more about one than the others wether the missing score is Y_1 or Y_2 or Y_3. Furthermore, it is assumed that $Y_1 \neq Y_2 \neq Y_3$.

THE PROCEDURES $\hat{Z}_1, \hat{Z}_2, \hat{Z}_3$

Under above assumptions we consider below bias present in each $\hat{Z}_i$; $i = 1,2,3$.

Bias in $\hat{Z}_1$: The expected value of $\hat{Z}_1$ is

$[2wY_3 + (1 - 2w) Y_4] p_1 + [2wY_3 + (1 - 2w) Y_4] p_2 + [2wY_2 + (1 - 2w)Y_4] p_3$
$= 2wY_2p_3 + 2wY_3 (1 - p_3) + (1 - 2w) Y_4$.

Using (1.1) the bias in estimating y by $\hat{Z}_1$ is

$$\ddot{Z}_1 = w(Y_3 - Y_2)(1 - 2p_3), \qquad (3.1)$$

the sign of which depends upon p_3. We note that $\hat{Z}_1$ is subject to bias when $p_3 \neq 1/2$. Denoting $\ddot{Z}_1 (p_3)$ as bias arising for p_3 we also note that

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grams of the Idris regime.

The advent of technology, the diffusion of culture from other parts of the world had affected the social life in Libya. The construction of a road network tying the cities together, the urbanization of the society, the rise of a middle class, and the formation of a Libyan nation, all contributed to the disintegration traditional of the society and the weakening of religious and tribal loyalties. Consequently, the popular base of the Sanussi dynasty, especially in Cyrenaica shrank. The unpopularity of King Idris, an absolute monarch who governed with the aid of a handful corrupt followers, grew in the rest of the country, particularly among the intellectuals. They, as well as other groups in the society, perceived the King as a tool of Western imperialism. Gradually, as a result of the combination of all these factors, the royal house lost a great deal of mass support.[15]

Concluding Notes

During the process of modernization, the people were politically socialized toward values and beliefs that were in contrast with the ruling elites' values and attitudes. This ideological contradiction, along with the effect of modernization itself, created a crisis of ligitimacy, and that was deepened by the absence of effective means of popular political participation in the decision-making process.

Because of Idris' inability, or lack of desire, to develop his regime politically, he eventually alienated the new emerging classes. In the long run, therefore, the King's destruction of political activities and his failure to create alternative means of channeling the energies of the socially mobilized, greatly served to produce a legitimacy crisis. As the

old traditional patterns of social control broke down, few new ones ever emerged.

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byan State, Idris took the reign and stated his rule by virtue of a religious, rather than a distinctively secular pattern of authority. Thus, the Sanussi movement became a tool of legitimacy for the Kingship.

King Idris derived his power partly from the traditional loyalty enjoyed by his family, and partly from his diplomatic activities during World War I and II, which resulted in his recognition as the Amir (Prince) over his people after World War I and in the final expulsion of the Italians from his country after World War II. In tribal areas, where the Sanussi Order was widespread, King Idris authority was supreme. But in the towns, where nationalism began to gain ground, Sanussi leadership was admittedly acknowledged as a political expediency.[10]

Social change and the Decline of the Regime Legitimacy

Social change can and frequently does give rise to new claimants to elite status and political power. In the case of Libya, the basis for change was to be found in the discovery of oil. In the short space of 10 years (1957-1967) Libya raised her per capita gross national product from approximately $ 50 to $ 1,018. The trend was geometric, witnessed by the fact that the increase for 1967 over 1966 was a startling 42 percent. By 1970 Libya had risen to the fourth largest and fastest growing oil producing contry in the world.[11]

These transformations in the Libyan economy were accompanied by dramatic changes in the country's social fabric. In rapid succession, increasing numbers of Libyans were swept up in the oil boom. The process of urbanization achieved revolutionary dimensions as demands for housing, health services, and educational opportunities proliferated. Educational improvements were impressive. The numbers of children served by the nation's schools rose from 33,000 in 1951 to 170,000 in 1965. In five short years enrollment nearly doubled again. Moreover, the more than 300,000 children attending school in 1970 included at least 85 percent of Libya's school-age population.[12]

By 1969 it was apparent that all these facts were dramatic. But much of the prosperity did not affect the majority of Libyans. Rather than creating happiness and contentment, the discovery of oil beneath the desert sand had done exactly the reverse. A closer look at the structure of the Libyan society explains this. Oil revenues had indeed enriched the country and promoted advances in various sectors. At the same time they had created or sharpened social disparities that in turn generated mounting tensions. It provided prosperity, directly or indirectly, for only ten percent of the total population, while 70 percent continued to wrest their meager subsistence from a decaying agriculture. The per capita income figures are misleading because they average the wealth of the privileged few with the earnings of the poor. For example, the annual income of peasants is less than $ 45.[13]

Relative deprivation and consequent frustration were encouraged by a government that, in spite of its development plans and public investments, was inactive and corrupt. The younger generation of Libya had long been restless over this problem. It was a vicious cycle for the new generation. They were more urbanized, literate, and sophisticated than their parents and those in the volatile urban centers were more numerous. While, in 1957, 80 percent of all Libyans lived in rural areas farming and tending their flocks, ten years later more than two-thirds of the population had migrated to the cities.[14] There, they became educated, informed, and were introduced to new ideas and ways of thinking. This occurred at the same time that the Libyan political system was being run by men whose lives dipped into the traditional past, whose behavior was nepotistic and personal-advantage seeking.

As the process unfolded, the bulk between the traditional ruling elite and the newly emerging social groups widened. Education and exposure to other societies produced a disenchanted educated elite; the oil industry produced a working class which was alienated as a result of the government's interference with union activity and its refusal to permit the formation of a labor union. Within the security services, youthful officers resented the favoritism displayed by the Palace for members of few families. A new generation was rising, anxious to assume responsible roles, outraged by rampant corruption in the organs of public administration, and determined to reform the policies and pro-

temporary setbacks, the basic direction of change toward a more secular and complex order of life will not reverse; and 9) *progressive* in that "modernization in the long run enhances human well-being, culturally and materially," with evolutionary change of this kind not only believed to be inevitable, but also held desirable.

Modernization and Legitimacy

The inculcation of a sense of legitimacy is probably, as noted by David Easton, the most effective device for regulating the flow of diffuse support in favor both of the authorities and of the regime. A member may be willing to obey the authorities and conform to the requirements of the regime for many different reasons. But the most stable support will derive from the conviction on the part of the member that it is right and proper for him to accept and obey the authorities and to abide by the requirements of the regime. It reflects the fact that in some vague or explicit way he sees these objects as conforming to his own moral principles, his own sense of what is right and proper in the political sphere.[6] Legitimacy of a political system can be derived from different source, i.e., traditional, social, religious, nationalistic, economic, or general capability in maintaining the belief that the present regime is best of all. David Easton pointed out three sources of legitimacy — ideological, structural, or personal — which may characterize support to any political system.[7]

Crises of legitimacy may be expected to be associated with rapid social change and the consequent tension between traditionalism and modernity. Since traditional societies share in common the acceptance of some actual or symbolic past event, order, or figure as the basis of their collective identity and as the ultimate legitimator of change, tradition serves to establish the limits beyond which creativity and innovation may be regarded as illegitimate. As Lipset notes, a crisis of legitimacy is a crisis of change. Its roots must be sought in the character of change in modern society as well as the nature of traditionalism. In other words the heart of the legitimacy problem stems from the fact that political change involves to a large extent the institutionalization of new norms

and structures that are aimed toward new goals. It is concerned with the compatibility between traditional leadership system and the demands or desires for new institutions and roles. It requires an examination of what makes political institutions hold together; of how political behavior becomes institutionalized; and of how certain institutions come to have authority and power over people which go beyond the application of force and coercion.[8]

In the case of Libya, the political legitimacy of the regime rested on the personal and religious traits of King Idris. There was no ideological identification between the regime and its people, largely because the regime had no ideology of its own, and more important, the educational conditions and the high rate of illiteracy in the early years of independence prevented any kind of ideology to prevail and have the support of the people. However, these circumstances did not hold for long. The rapid social change and urbanization undermined much of King Idris personal and religious legitimacy. On the other hand, the vast and rapid expansion in education, accompanied with the increase of the Arab nationalism effect in the whole Arab World including Libya, created a strong and articulate intellectual class motivated by the ideas of Arab nationalism and Arab unity. This created a sense of ideoligical identity among many segments of the population, especially among students, labor forces, civil servants, and junior army officers. This emerging ideology found itself incompatible with the traditional regime and, as a result, these new forces felt that the regime was not able to translate their beliefs into action. Accordingly, the regime lost its legitimacy among the emerging new forces.

Until September, 1969, Mohamed Idris al Mahdi al Sanusi, King Idris I, was the central source of political leadership in independent Libya. The Sanussi dynasty in Libya rested its legitimacy upon religious and social factors. The Sanussi movement introduced a concept of legitimate central authority which was in conformity with the tribal attitudes. Consequently, the leader of the Sanussi movement became both the final religious authority and the intermediary who solved tribal disputes.[9] After the establishment of the Li-