

**Minutes of the British War Cabinet, September 18, 1940:
A Non-mathematical View of the
Logical Consequences of Portfolio Turnover**

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A meeting of the full War Cabinet was held at 8:00 PM and was chaired by Prime Minister Churchill. All members were in attendance, and reports were given by the Minister of Supply, Secretary of State for War, Secretary of State for Air, Chief of the Air Staff [RAF], and the chairman of the Chiefs of Staff Committee. Mr. Churchill inquired as to the progress that had been made in the reduction of Fighter Command aircraft losses due to mechanical malfunction as opposed to enemy action. The Chief of the Air Staff, Sir Cyril Newall, replied that all aircraft were completely inspected for wear as opposed to battle damages after 100 hours of recorded flight time. However, Air Staff statisticians had discovered the most curious anomaly. The required 100 hours of flying time was divided for statistical purposes into 10 hour increments. It was logically anticipated that the first 10 hour block after inspection (0-10 hours after inspection) would manifest the fewest aircraft malfunctions and the last ten hour block (90-100 hours) would manifest the greatest number of malfunctions. In actuality, the number of malfunctions was greatest in the first ten hour block of flight time subsequent to the last inspection. The number of malfunctions decreased in linear fashion in each of the next four statistical blocks and then held a constant ratio until 100 hours had elapsed and the next inspection was conducted. Mr. Churchill remarked as follows: "Gentlemen, these 'boffins' in the statistical office always confuse one with their data. The data they have is never the data they want, and the data they want is never the data they need." It was agreed that an interministerial committee should conduct a thorough study of this matter forthwith.

This account of a War Cabinet meeting is entirely fictional. However, the problem of malfunctions increasing subsequent to aircraft inspections is entirely true.* The bravery of RAF pilots defending the British Isles against overwhelming odds is legendary. It is quite easy to imagine the anguish which must have been felt by RAF personnel to witness a plane crash on takeoff during a scramble alert that was obviously due to aircraft malfunction. It is only logical that every effort was made to reduce malfunctions. Nonetheless, the malfunctions increased.

This problem is actually rather similar to the problem of the portfolio manager who seeks to increase return by the construction of ever more elaborate and extensive systems

* Those interested in a more extensive account should consult C. H. Waddington: *Operations Research in World War II*

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designed to gather information. Obviously, not all companies are willing to release equivalent amounts of information. Indeed, not all managements even possess equivalent amounts of information. If the information is provided, it may suggest a trend or it may be an aberration of a trend. Thus the data may be meaningful or meaningless. Moreover, whether meaningful or meaningless, the data must be correctly interpreted. Unfortunately, even a correct interpretation of meaningful data may be devoid of value; if the data is first obtained by other investors, the new information (whether positive or negative) will be reflected in the price of the security to be traded and thus no competitive advantage will be realized.

Therefore, it logically follows that a portfolio manager must assimilate great quantities of data in a very short period of time. In principle, it should be fairly easy to obtain information which is too late to be of use since Company A might report significant developments while Company B is being analyzed. If a portfolio manager were to work 100 hours per week, or nearly 15 hours each day, without interruptions of any kind--an obvious absurdity--a 50 stock portfolio would permit only 2 hours of study per company per week. The scrutiny required of potential investments, as well as administrative functions in addition to the need to rest on weekends, would rapidly decrease the average weekly analytical time for a specific investment to a very small quantity.

Thus, large quantities of data which must be evaluated and acted upon in a brief time period should theoretically result in a significant error rate. It is evident that the error rate is indeed rather large since it is usually reported that most fund managers underperform various indices. However, the underperformance results not from lack of information or want of effort. It is the extent and nature of the effort that gives rise to the problem. Consequently, a high turnover rate is related to poor performance. Reductions in transaction costs might not necessarily improve performance since it reduces the impediment to trading and a greater level of activity will be associated with a greater error rate.

This was indeed the problem experienced by Fighter Command. During inspection, any part exhibiting signs of wear was replaced. In addition, parts that had a low mean time to failure were routinely replaced. Unfortunately, this required much disassembly and reassembly of the aircraft. Although the aircraft contained new parts, the more service that was done on the aircraft, the greater the probability that installation and reassembly were improperly done. This explains the large number of malfunctions subsequent to inspection. The diligence of the ground crews had the *unintended consequence* of increasing, not decreasing, aircraft malfunctions. Hence a diligent, attentive and active portfolio manager might actually reduce returns. Intelligent inactivity is a rare virtue.