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Making Business Odds Work for You

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Gambling seems the very antithesis of sound business planning. Yet 'figuring the odds' and acting on them can pay off in many concrete business situations—

MAKING BUSINESS ODDS WORK FOR YOU

by William E. Arnstein
Main Lafrentz & Co.

BUSINESSMEN make decisions many times a day, often in cases where an error in judgment could be very costly. A few generations ago even major decisions were largely intuitive. As a result, business mortality was uncomfortably high.

Today, most important decisions are made after careful analysis of available data. Consequently, the proportion of wrong decisions has been greatly reduced. A new approach to data analysis has helped a few companies reduce still further the chance of wrong decisions. This approach can best be described as "figuring the odds."

As every gambler knows, although it may be a foregone conclusion that Siwash will beat Amateur U. by at least 40-0 in the upcoming game, every so often an Amateur U. will spring a major upset on a far more powerful opponent. Similarly, a business decision made by intuition, by analyzing data, or by figuring the odds can still prove wrong. The chances of a wrong decision are, however, lessened by sophisticated techniques.

Furthermore, just as in roulette the house has the odds in its favor and, therefore, always comes out ahead in the long run, so will a business that figures the odds come out ahead in the long run although not every move will prove to be the right one.

In poker, football, and horse racing, each bet is settled on a "yes" or "no" basis. You either have the best hand or you don't; your team wins by more than the designated point spread or it doesn't; your horse either finishes where you picked it or it doesn't. The results of business decisions are not so clear.

You may plan on making $1,000,000 and actually come out with a $1,000,000 loss, but you may also make $200,000, $627,150, or even $2,000,000 on the investment on which you planned to make $1,000,000. Thus, business odds calculations are substantially more complex than gambling theory. The remainder of this article will be devoted to some examples of where and how businessmen can introduce odds analysis into decision making.

An investment case

Certain investment funds invest only in embryonic companies. For example, a fund of $100,000,000 might decide to put approximately $10,000,000 in each of ten situations. Each prospective investment would be carefully studied to determine whether the product was exciting, the market large, the margin between selling price and cost adequate, and the company management competent. For each accepted investment, profit projections based on all available facts will show earnings and growth rates at the end of a five-year period that will justify a market

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price for the stock of many times the current price.

However, the management of the fund is aware that unforeseeable circumstances have a way of arising in untried companies. Products have a tendency to develop faults in commercial use that must either be corrected by increases in manufacturing costs or cannot be corrected at all; markets are sometimes unexpectedly resistant to new products; competition may even now have a vastly superior product on the drawing board; management may die or be lured away; and strikes can foul up the operation. In fact, history indicates that a very high percentage of apparently well conceived new companies fail for one or another reason in their early years.

Thus, in the ten prospective investments, the fund's management might decide that it was reasonable to expect that three would work out as planned and the other seven would be completely lost. Therefore, only if the profit projections and related stock values of an individual company will result in adequate fund growth and return on investment, after applying a 70 per cent discount for risk factor, will the investment be made. The important point here is that the assumption has been made that three of the projections will work out as planned and seven will result in total losses, not that each projection is overstated to the extent that a 70 per cent discount is required. However, the arithmetic will give the same result as if each profit projection were overstated by 70 per cent.

Capital project evaluations

Certain types of capital projects have many of the characteristics of an investment in embryonic companies. A company that is building a plant to produce a new product, to supply a new market, or to take advantage of a new process or different raw material will often prepare a projection of future cash flows to determine whether, on a discounted cash flow basis, the rate of return meets its investment criteria. Projects as simple as replacing an obsolete machine tool or adding space to an existing warehouse may be evaluated based on future cost savings. In either case, a technique referred to as sensitivity analysis has come into increasing use to aid management in its evaluations.

Sensitivity analysis merely consists of changing several assumptions in the cash flow projection, one at a time, to determine how the changes will affect net cash flow. To cite just one example, an East Coast company might be considering the construction of a Western plant to supply the West Coast with a product hitherto not sold beyond the Rockies because of prohibitive freight costs. Based on well supported assumptions, the plant is projected to provide a cash flow of $500,000 per year. However, one of the assumptions is that the West Coast market will absorb 15,000 units per year at the projected selling price.

Sensitivity analysis would require that the cash flow also be determined if only 14,000 units per year were sold. It would also require separate calculations of cash flow assuming lower selling prices, higher labor costs, increases in real estate tax rates, or any other material factor in the original assumptions. It should be noted that the results obtained are not always readily foreseeable. In one projection, a 10 per cent increase in labor rates might cut cash flow by 1 per cent, and in another industry the same 10 per cent increase in labor rates might cut cash flow by 20 per cent.

Under the original concept of sensitivity analysis as applied to capital project evaluation, management compared its confidence in each basic assumption in the projection to the variation from the original projected cash flow caused by possible inaccuracies in the assumption and then reached a decision.

Under later concepts, sometimes referred to as risk analysis or probability analysis, a likelihood is assigned to each value of an assumption. Thus, the original projected labor rate might be assigned a probability of 50 per cent, a labor rate 10 cents per hour lower might be assigned a probability of 15 per cent, a labor rate 5 cents per hour higher a probability of 20 per cent, a labor rate 10 cents per hour higher a probability of 10 per cent, and a labor rate 20 per cent higher a probability of 5 per cent. Note that the probability percentages must add to 100 per cent. The cash flows based on the various labor rate assumptions are multiplied by the applicable probability percentages, and the results are added to provide a cash flow that reflects the weighted average of the labor rate assumptions.

The same technique can be used for obtaining a weighted average cash flow on variations of one or more other basic assumptions, and the several weighted cash flows can be arithmetically averaged to give an expected cash flow that reflects the real value of the basic assumptions much more accurately than any single projection.

The calculations required in this type of analysis are not as difficult or as time-consuming as might at first appear. Many of the later figures can be derived from factors in the earlier calculations. However, on complex projects the use of a computer may prove economical, particularly if the company expects to have similar projects to evaluate in the future. It should, however, be noted that

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companies using this technique ordinarily confine its use to major projects.

Stand-by equipment

Many companies are occasionally faced with the need to decide whether it is worthwhile to own stand-by equipment, i.e., equipment that will be used only in the event of a breakdown in regular equipment. There are, of course, some decisions of this kind that cannot be evaluated on the basis of profits. For example, the need for battery-operated emergency lighting in the operating room of a hospital is such a vital matter that it is unrelated to the income lost by a temporary loss of power. However, there are many stand-by problems, from repair parts to whole power plants, where the profitability can be analyzed.

As in the case of the investment decisions referred to previously, it is not the thought that each individual piece of stand-by equipment will necessarily pay off, but the question is whether the probability that it will be required multiplied by the loss it will avoid is greater than the annual carrying cost of the stand-by equipment.

An example would be a large motor used to drive a conveyor essential to the operation of a plant. If the motor fails, it is estimated that a repair will require 24 hours and an entire eight-hour shift of 100 employees will have to be paid $4.00 per hour (including fringe benefits) while producing nothing. Thus, the loss from a motor failure will be 8 × $4.00 × 100 = $3,200. It is known that other motors used by the company fall into three classes, one of them with a history of two failures per year, one with a history of one failure every two years, and one that has never had a failure. It is believed the conveyor motor has a 40 per cent chance of being similar in failure characteristics to the first class, a 40 per cent chance of being similar to the second class, and a 20 per cent chance of being similar to the third class.

The chances of annual cost of failure of the conveyor motor are then:

40% × 2 × $3,200 =	$2,560
40% × ½ × 3,200 =	640
20% × 0 × 3,200 =	0
Total	$3,200

If the annual carrying cost of a stand-by conveyor motor is less than $3,200, the motor should be purchased; if higher, it should not be purchased.

It should be noted that in all the illustrations cited herein, neither the costs nor the probability of occurrence are at all easy to estimate. However, it has been found that estimating these factors separately and then going through the indicated calculations will give results that are substantially more accurate than if the conclusions were reached by a combination of tradition and intuition.

Some companies have the problem of determining whether or not it would be profitable to hire one or more stand-by operators. For example, a company was operating on three shifts and was still unable to keep up with the demand for its products. The bottleneck operation was a group of some 20 machines that required one operator each.

Union rules prevented the use of other personnel on these machines and prohibited these operators from doing other work. Due to space and capital limitations, the company was unable to increase the number of machines in the bottleneck operation. Frequently, operator absenteeism (usually without notice) caused one or more machines to be idle for a whole shift. The company had been considering hiring one or more stand-by operators for each shift but until it "figured the odds" had been unable to guess how stand-by operators would affect net profits.

Fortunately, absentee records were available, as well as production per shift per machine and the gross margin on the product (i.e., the difference between selling price and variable costs). Absentee records indicated that for the first shift there had been no absences on 35 per cent of the working days, one absence on 30 per cent of the days, and two or more absences on 35 per cent of the days. Production per machine per shift had a sales value of $250 and a gross margin of 20 per cent. Workers were paid $4.00 per hour including fringe benefit costs, and shifts were eight hours long.

Calculating the odds

Based on these facts, the loss of gross margin (after direct labor cost) and, therefore, of profit due to an idle machine is $250 × 20% or $50 per day. The cost of a stand-by operator is $4.00 × 8 or $32 per day. A single stand-by operator would be useful 65 per cent of the time and would thereby add to profits an average of $50 × 65% or $32.50 per day. He would cost the company $32 on 35 per cent of the days or an average of $11.20 per day. Based on these figures, the hiring of a 21st operator to cover absences would add to profits an average of $21.30 ($32.50 — $11.20) per day.

A 22nd operator would be useful 35 per cent of the time and would thereby add to profits an average of $50 × 35% or $17.50 per day. He would cost the company $32 per day on 65 per cent of the days or an average of $20.80 per day. On these facts, his hiring would not be justified. In this company, however, second- and third-shift absenteeism was higher, and two stand-by operators were found to be profitable for those shifts.

Competitive bidding

Certain companies, such as job machine shops, job printing companies, and construction subcontractors are constantly quoting prices on work against strong competition. The lower the price quoted, the greater the chance of obtaining the order, but if the bid is successful, the profit on the order will also be lower.

If each quote is considered individually, prices quoted are apt to vary based on which side of the bed the price estimator got up that morning. However, if some history is gathered on past successful and unsuccessful quotes, it becomes possible to estimate the chances of success of a quote that is a certain percentage above variable costs.

In competitive bidding situations, if some history is gathered on past successful and unsuccessful quotes, it becomes possible to estimate the chances of success of a quote that is a certain percentage above variable costs.

Thus, it might be found that quotes 20 per cent above variable costs were successful 90 per cent of the time, that those 30 per cent above such costs were successful 75 per cent of the time, and those 40 per cent above had a 50 per cent chance. A request for quotation is received on an order which has a variable cost of $1,000. If the price quoted is $1,200 (20 per cent above variable costs), the contribution to profit would be $200 and there is a 90 per cent chance the quote will be successful. Thus, the contribution to profit that can be assumed if this price is quoted is 90 per cent of $200 or $180. Similarly if the price quoted is $1,300, there is a 75 per cent chance the quote will be successful, and the contribution to profit that can be assumed is 75 per cent of $300 or $225. If the price quoted is $1,400, there is a 50 per cent chance that the quote will be successful, and the contribution to profit that can be assumed is 50 per cent of $400 or $200. The best quote would therefore be $1,300.

Obviously other factors enter into such bidding. For example, will a successful bid at a relatively low price fill the plant's capacity for such a long period that more profitable business will have to be refused? Is the plant likely to have to lay off workers who will be difficult to rehire if the bid is too high? Is a high bid likely to drive a good customer into the arms of a competitor? But all these factors can be better evaluated if the basic relationship between gross margin and probability of success has been evaluated initially.

Credit granting

Most customers are entitled to all the credit they want, and no problem arises. This is true of both consumers and commercial buyers. But most companies that sell on credit are frequently faced with the problem of refusing a sale or making it with the knowledge that there is a real chance that the customer will never pay. Many companies have a bad debt percentage target and accept or reject such orders in terms of whether it appears that they will be able to stay within this bad debt percentage. However, these borderline orders can be viewed in another way. To reject an order for which the customer would have paid is to lose the gross margin on that order. To accept an order for which the customer never pays is to lose the variable costs of the merchandise in the shipment.

If the odds on the customer's paying can be estimated (and this is being done consciously or unconsciously when the effect on the bad debt percentage is considered), it becomes possible to compare these odds with the gross margin percentage. Thus, if the gross margin is 40 per cent and the chances of the customer paying are 70 per cent the probable loss from the rejection of a $100 order would be 40 per cent of $100 × 70% or $28, whereas the probable loss from acceptance would be the variable cost of $60 times the 30 per cent chance of the customer not paying or $18. The order should be accepted.

The above example will hold true in most situations but is subject to exceptions where plants are at capacity or working capital is limited.

Salary administration

Every company from time to time is faced with the fact that a valued young executive has resigned in order to accept a higher-paying job elsewhere. It realizes that in replacing the lost employee there are substantial one-time costs of employment, training, and lack of efficiency and judgment errors in the break-in period. Could these losses have been avoided by a generally higher salary scale for all young executives? (Offering a salary increase to the particular individual after he announces his plan to leave has certain disadvantages and is not always effective.)

While recognizing the costs of this type of turnover, most companies are also aware of the economic impossibility of paying any group salaries so high that no member of the group will ever leave for a more attractive offer.

Figuring the odds requires some research into the costs of replacing a member of the group and this means all costs. Employment fees might be found to average $3,000; interviewing costs might be found to be $1,000; training costs might be estimated at $3,000; and loss of efficiency during the break-in period $4,000 for a total of $11,000. It might also be found that there are about 12 resignations per year in a group of 50 whose total annual compensation is $750,000.

A 5 per cent salary increase for the group will cost the company $37,500 per year. It is believed that such an increase will have a 20 per cent chance of reducing resignations by 10, a 40 per cent chance of reducing them by 6, a 25 per cent chance of reducing them by 4, and a 15 per cent chance of reducing them by only 2. The prospective reduction in turnover costs is then:

20% × 10 × $11,000 =	$22,000
40% × 6 × 11,000 =	26,400
25% × 4 × 11,000 =	11,000
15% × 2 × 11,000 =	3,300
Total	$62,700

Since this saving is substantially higher than the cost of the salary increase, the increase should be made.

Because the saving is so substantial, a test should be made as to the profitability of a greater salary increase—say, 10 per cent. Such an increase is believed to have a 40 per cent chance of reducing resignations (from current level of 12 per year) by 10, a 30 per cent chance of reducing them by 6, a 20 per cent chance of reducing them by 4 and a 10 per cent chance of reducing them by only 2. The prospective reduction in turnover costs is then:

40% × 10 × $11,000 =	$44,000
30% × 6 × 11,000 =	19,800
20% × 4 × 11,000 =	8,800
10% × 2 × 11,000 =	2,200
Total	$74,800

Since a 10 per cent salary increase will cost $75,000, the decision is borderline, and the 5 per cent increase will probably be decided upon or an intermediate figure.

Summary

The foregoing are just some of the problems to which a probability approach is applicable. In individual companies, factors not mentioned in the examples might be important, but the theory applies in the illustrations even if modifications are necessary or desirable. The basic formula is: Multiply the anticipated profits or costs by the chances (as percentages of the whole) that these profits or costs will result to arrive at the true value of the course of action. An executive who begins to think in these terms will find many applications of the formula and will be able to make decisions which will enhance his company's profits.

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