

Towards Better Budget Management

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In periods of crisis, budgets are rarely respected. Pleasant or unpleasant surprises make budget revisions necessary. More generally, good management practices require constant updates of budget planning, reflecting not only the most recent realized figures of the business, but also the most up-to-date information available on the fundamentals of the business activity. To that end, reporting and management planning can greatly benefit from a statistical approach.

We propose two simple improvements to current management processes. They are meant to reinforce decision-making during budget preparation. Most important, they help to ensure better financial reporting and better management throughout the year.

Budget creation and monitoring may be considered along the following broad lines:

- Budget development based on explicit hypotheses regarding the context and factors exogenous to the company using currently available information (current orders, as well as growth in demand, currency movements, etc.);
- Budget-centered dialogue between different local units and the group finance department;
- Determination of necessary and possible investment allocations related to business activity;
- More generally, selection of the scenarios retained by the company (pricing policy, recruitment and marketing plans, etc.), possibly contingent on certain exogenous developments anticipated over the coming year;
- Apportionment and monitoring of central budgets on a monthly basis, even if certain indicators are weekly or daily;
- During the financial year, comparison of business activity figures with those of the budget, analysis and explanation of discrepancies observed on a monthly basis, local unit steering by central management;
- Updating in midstream to a new budget plan according to actual results and newly available information; indeed, certain companies are sometimes satisfied with simply making an in-year budgetary revision;
- Financial reporting to shareholders and within the company.

In this process, even though identifying unit as well as company performance is essential, it is often poorly done. Moreover, budget information is not always exploited for the purpose of liquidity and financing management.

Two articles to facilitate management without getting caught up in excessive management control:

“Cash at Risk: Managing Liquidities”

A solid economic (and accounting) vision in budget management enables management of the company. The latter, however, is conducted within the constraints of financing. Specific analysis should therefore be devoted to financing flows. The first article in this month's newsletter presents the principles of liquidity management using risk measurements. Cash at Risk, which benefits from the example of banks' all-too-frequent misuse of VaR, helps to ensure a better link between a company's economic reality and its budget management. For, during periods of crisis, liquidity is at the heart of a company's survival. It is also an essential function indicating or, indeed, providing the room for maneuver for true company management.

“Business Reporting Differentiating Exogenous Shocks and Performance”

The second article deals with company reporting.

Examining firms' quarterly or annual financial reports often reveals foreign currency effects, sometimes the impact of raw material price variations.

Except for in very qualitative terms, assessments touching on the overall economic situation and its impact are rarely indicated, preventing any clear identification of the consequences of company management decisions and thus of the company's intrinsic performance. Generally, only comparison with other companies in the same sector, or with the sector in its entirety, provides a measurement for over- or under-performance.

Likewise, although more and more companies have become aware of their vulnerability to weather conditions (the impact of temperature, sun, rainfall, etc., on their business activity), none calculates the impact in its reporting.

In what follows we offer several easy-to-implement budget-based methods for taking better advantage of business reporting. These methods open the door to company management truly attuned to performance and risk.

Cash at Risk: Managing Liquidities

Cash at Risk is a statistical measurement of company liquidity levels. Like Value at Risk (VaR), it measures the lowest level of cash on hand anticipated in non-worst-case situations. Formally, “worst-case” configurations of 1% probability (either 5% or 0.1% according to company thresholds) are excluded. To this end, cash inflows and outflows have to be figured as probabilistic variables. The approach is particularly valuable, since it requires identifying the risk factors to which the company is exposed. Like VaR, the approach must be complemented so that the measurement of risks isn’t excessively approximate, and the risk assessment over-optimistic. A “Multi-horizon” measurement of Cash at Risk reduces the drawbacks of VaR and is more in line with a dynamic picture of company cash positions over several months. Likewise, the implementation of Stress Tests also strengthens liquidity management.

Liquidity Management

Budgets derived from a company accounting perspective are “translated” into forecasted cash inflows and outflows by the treasurer. The latter must ensure the company’s ability to deal with its expenses. In this way, she manages the financing of the company by anticipating its cash position. In the short term, she relies on the annual budget, and in the long term, she must act in accordance with the investment plan. The cash position thus brings to light financing needs that must be evaluated as meticulously as possible in order to avoid needlessly increasing finance costs, or cash surpluses whose investment should be optimized. Budget management should therefore allow the company to carry out liquidity management. In this area, the more fine-tuned the forecasts, the more efficient the policy implemented to manage financing or investment will be.

Liquidity management is conducted through management of current assets and liabilities and risk/return oversight under normal operating conditions. As such, liquidity is measured by comparing contractual debt maturities and estimates of other cash inflows/outflows. Even over short time horizons, the latter are changeable.

By modeling this uncertainty using risk factors with an estimated probability distribution, liquidity is measurable through Cash at Risk, which relies on the principles of Value at Risk (VaR). It amounts to measuring the liquidity balance resulting from all cash inflows and outflows, with a certainty of x%, within a given time horizon (6 months, a year). It allows the treasurer to manage the company’s exposure to variations in economic conditions and, more generally, in risk factors likely to affect cash inflows and outflows (accelerated growth, increased supply costs, drops in turnover and, thus, in accounts receivable, rises in inventory expenditures, etc.). Such variations can have several consequences on the conditions in which the company operates:

- Reevaluation of financing or refinancing policy;
- Interest rate variations undermining hedging strategies;
- Limitation of the company’s ability to procure additional financing due to excessive indebtedness;
- Downgrade of the company’s rating.

The calculation of Cash at Risk relies on a three-step method:

Step 1:

Identification of risk factors likely to affect monetary flows

Step 2:

Quantification of economic and behavioral sensitivities or elasticities: market- or, more generally, risk-factor-movement scenarios impact production volumes, sometimes sales prices (rates), competitors' reactions, supply changes, etc. It is at this stage that "economic" approaches to Cash at Risk, which take into account the company's specific industry, distinguish themselves from purely financial and statistical approaches. Indeed, there is no generic modeling, for elasticities are specific to each company.

Step 3:

Stochastic (Monte Carlo Method) or economic (Stress Tests) future scenarios: cash flow projections over x periods within different scenarios and identification of the probability distribution of the aggregates considered: cash, net income, debt to equity, etc.

This scenario-generation enables modeling the company's "response" to shocks for associated risk factors; again, the determination of the company's response may be more or less sophisticated:

- The capital optimization structure and the optimization structure of derivative strategies;
- Evaluation of static or dynamic hedging and borrowing and investment policies;
- The approach also allows one to include counterparty risk and exposure measurements.

It is of course possible to utilize the approach using only certain risk factors (i.e. financial), leaving unchanged traditional liquidity management practices.

Towards Better Management of Extreme Situations

Stress Tests

VaR and statistical approaches have been seriously called into question during the recent crisis due to their inability to measure risks ex-ante, especially those bearing on liquidity, within banking establishments.

Similarly, "traditional" Cash at Risk is not sufficient to account for companies' liquidity risks, for it does not deal with extreme events like liquidity crises, which we have once again recently experienced. The use of crisis scenarios, Stress Tests, should complement Cash at Risk.

Stress Tests represent hypothetical (either historical or adverse¹) scenarios for risk factors. They are used in order to identify vulnerabilities to and distortions of the balance sheet. Their analyses consequently enable the determination of contingency plans in case of crisis, i.e., the best reply when the alarm bells go off. The tests are an integral part of internal controls. VaR measures loss risk in “non-crisis situations.” A variant of VaR, C-VaR, takes the tails of the distribution into account and remains a simple statistical measurement. However, it doesn’t allow one to modify, as is the case with a Stress Test, the company’s best reply to a shock.

Multi-Horizon VaR

Beyond balance-sheet management linked to a budgetary year, it is important to construct a view of the company’s cash gaps over the entire year.

An approach based on Multi-horizon VaR² allows the company to generate reports projecting the minimal liquidity level for a given level of risk for all dates, from a single day to one year. It thus becomes possible to simulate portfolios or loans in a way that respects specific requirements according to different dates. Although probabilistic, the approach succeeds in quantifying the uncertainty of an already uncertain cash budget forecast. It offers truly dynamic management by better measuring consequences and decisions with different horizons, including the implementation of optional strategies.

Specific stress scenarios are easy to add. This includes adverse risk scenarios, which aim at measuring the company’s ability to deal with extreme economic situations and even with those approaching bankruptcy.

Implementing Liquidity Management: a Source of Value

The vision of liquidity management proposed here is a source of value for the company, providing better visibility and better cash management – and, therefore, greater financial optimization. Its implementation also requires the identification of company risk factors, which, in itself, is one of the keys to good management, and may be set out in three steps:

Step 1:

An initial inventory is based on four analyses:

- Cash cycles: their existence and causes have to be identified
- The information available to the treasurer: budget estimates at different time horizons, end-of-year estimates for the beginning of the following fiscal year, the tools to deal with the information
- The sources of company financing
- The company’s liquidity deficit at different time horizons

Step 2:

Identification and quantification of risks are handled in two ways:

- Analysis of risk factors of the business, examples of which have been given above
- Modeling of economic elasticities of company income and spending in line with these risk factors

¹ See OTC Conseil Letter no. 38 – April 2009, “Vulnérabilité et Stress tests adverses” (in French).

² OTC Conseil is leading a collaborative project, approved by Finance Innovation (Paris Financial Services Cluster), on Multi-horizon VaR.

Step 3:

As for **management**, it depends on implementing simulation – and therefore risk-calculation – and reporting models, as well as on establishing recommendations.

The depth or exhaustiveness in terms of risk factors or method (simple Cash at Risk, Stress Tests, Contingency Plans, Multi-Horizon VaR, etc.) should be defined according to the company's specific preferences and, in any case, should be put in place gradually.

A Management Tool

Liquidity management can be conducted using traditional budget data. The introduction of a risk-based approach is easily feasible. It represents a complementary analysis for decision-making by combining considerations of risk and purely economic ones. Cash at Risk allows one to include management planning within the global policy of risk management and to equip the company with additional management tools on the basis of considerations specific to its particular industry. •

Business Reporting: Attributing Performance

Earnings and business activity reports, as well as quarterly and annual financial reports, only rarely separate the impact of exogenous shocks to the company from its actual performance. Exogenous risk factors are many: the overall economic climate, the price of raw materials, calendar effects, etc. A growing number of companies have also become aware of the significant impact of weather on their business activity. Without claiming to predict the exogenous factors, explicitly accounting for them in budget scenarios easily allows a company to separate out questions of company performance, management decisions (marketing, pricing, etc.), and the unforeseen development of exogenous risk factors. The approach contributes to better progress reports as well as better management: identification of business unit performance, management decisions, and, potentially, hedging strategies.

Exogenous Factors or Risk Factors

Whether we are talking about turnover and company operating income or about different decentralized profit centers, it is only natural for executive management to know their fundamentals.

Description of the company's business model entails nothing more than this fundamental analysis. When available, factors ("drivers") characteristic of company demand are carefully studied. Those affecting supply are also important in certain business models.

Factors may be quite disparate; most often, it is preferable to establish a composite indicator that summarizes the information rather than to describe and model demand too precisely. For it is especially important to be able to follow the indicator over time without waiting for all the information to become available.³ In this way, when the customers are individuals, indicators like the unemployment rate or consumer confidence can "composite" more structural information based on household revenue or consumption and, more specifically, information from the segment concerned (socio-professional group, geographical area, etc.).

Other factors affect demand, often in a quite mechanical way: calendar effects for individual customers (number of days open each month, timing of school holidays in the year, etc.). Another kind of exogenous factor is increasingly followed and calculated: the weather (temperature, rainfall, sunshine, etc.).

The effects of each of these factors are uncertain, and they are themselves for the most part difficult to predict. They represent demand risk factors. Furthermore, demand may be affected by aspects of company management (marketing expenditure, communication, discount amounts, etc.) or, directly, by pricing policy.

Moreover, company business activity is sometimes determined by supply. Its production capacity may limit business activity. Checks on a factory's capacity or on the supply chain or, in the service industry, constraints on personnel may come into play.

A company may thus see its expansion checked by the diminished demand or by its own capacity constraints. These different growth "regimes" sometimes arise as a function of the overall economic circumstances in which the company finds itself or as a function of

³ Of course, it is as important to carry out precise analyses, although the latter should be done less frequently, on an annual basis, for example, and not as part of ongoing infra-annual monitoring.

company history. Income items (GOP, EBITDA, etc.) are affected in any case by factors stemming from supply and demand, along with additional factors arising from costs (input prices, currency, interest and tax rates, etc.).

It is at once easy and advantageous to account for changes in turnover, profit and the different components of business activity in terms of changes in the company's fundamentals represented by these different risk factors. Such an approach aims at calculating the contributors to performance and at making reports clearer. If the budget is in line with the hypotheses of evolving fundamentals, then the performance gaps between realized and budgeted figures can be calculated and analyzed through "performance attribution."

Business Reporting and Performance Attribution

Suppose that company turnover is a function of two exogenous factors:

- The overall economic climate (consumer confidence index);
- The weather (temperature, for example);

and of a management variable (measured by expenditures, or by the amount of price discounts accorded, etc.).

Turnover is written: $CA = CA(X_1, X_2, E)$ according to the values taken each month by the three explanatory variables of the turnover. Often, the chosen function is simply linear (see below).

Analysis of month over month turnover is written as a first-order approximation:

$$\frac{dCA}{dt} = \frac{\partial CA}{\partial X_1} \cdot \frac{dX_1}{dt} + \frac{\partial CA}{\partial X_2} \cdot \frac{dX_2}{dt} + \frac{\partial CA}{\partial E} \cdot \frac{dE}{dt}$$

Of course, rarely do the three variables explain all the changes in turnover. Other factors – in particular, internal company performance (team performance) or, simply, chance – end up filling out the picture every month (we will return to this below). However, analysis of business activity is in this case simply interpreted – with orders of magnitude – in function of contextual developments and of company decisions.

Let us assume that, knowing this function of turnover, the budget has been created by defining trajectories for the three explanatory variables for the 12 coming months. Let $CA^B(t) = CA(X_1^B(t), X_2^B(t), E^B(t))$ be the monthly forecast retained for the budget, while the function $CA = CA(.; .; .)$ stays the same. Performance attribution will in this case consist in considering the variation observed in turnover from one month to the next, in comparing it to that anticipated in the budget, and in explaining the difference with the following formula:

$$\frac{dCA}{dt} - \frac{dCA^B}{dt} = \frac{\partial CA}{\partial X_1} \cdot \left(\frac{dX_1}{dt} - \frac{dX_1^B}{dt} \right) + \frac{\partial CA}{\partial X_2} \cdot \left(\frac{dX_2}{dt} - \frac{dX_2^B}{dt} \right) + \frac{\partial CA}{\partial E} \cdot \left(\frac{dE}{dt} - \frac{dE^B}{dt} \right)$$

According to the type of function and the significance of "forecasting errors," the approximation leaves a larger or smaller residual term, and one may then seek to determine to which "points" the partial derivatives apply.

In the majority of cases, most of the performance gap can be explained by deviations in budget forecasts of the exogenous variables (the context) and the decisions taken by the

company (possibly in reaction to changes in the context). The deviations are weighted by partial derivatives and represent different “effects” that have an impact on business activity and “explain” over- or underperformance.

Analysis and Forecasting: Econometrics

Supply and demand functions are often complex. Management control mechanisms are increasingly sophisticated. The goal here is not to take aim at complexity. On the contrary, the goal is rather to identify the principal factors at stake for the company. Whether other factors affect the company doesn't matter, as long as they don't finally have an underlying impact and the company's history allows one to believe that they will cancel each other out.

Certain econometric techniques (see Annex), simple to use but particularly theory-based, enable one⁴ to find the happy medium between relevance and efficiency. Econometric estimates are not intended to aid in forecasting. A temporal scenario for each of the explanatory variables simply ensures the coherence of the turnover and income budget scenario. In certain cases, it is possible to use these models in forecasting. In any case, they enable risk analyses through simulation.⁵

Performance and Management

Often, certain variables appear clearly explanatory (expenditure, marketing, pricing, personnel, etc.). In this case, it is possible, over the course of the year, to implement responses to developments in the overall economic situation. Operational management is one of the sources of company performance. Certainly, as far as competitiveness is concerned, there remains everything that will never be measurable and that depends on the intelligence and effort provided by employees.⁶ This last point is of utmost importance with regards to managing different units of a company, beyond the mechanical outcomes anticipated in the budget.

The forecast error is a good indicator of internal performance. It includes, of course, other non-measurable exogenous factors, but it can be normalized and should serve as an alarm should thresholds be exceeded.

⁴ The same techniques that enabled C. W. J. Granger to win the Nobel Prize in Economics in 2003!

⁵ See the article “Cash at Risk,” p. 17, or our article, “Risk Budgeting and Managing through Risk.”

⁶ See the literature regarding Principal/Agent relations and our articles on “Management Decentralization.”

Planning and Managing

Budgetary management is first of all a planning then a management exercise. It is often part of a long-term vision for the company, but it does require communication – with shareholders, markets, employees – which should be handled infra-annually: on what bases are the budget hypotheses constructed? Why is the company ahead/behind on its operating schedule?

Similarly, operational management must measure company risks⁷ and account for company performance. The approach proposed in this article is easy to implement. It can help strengthen – without requiring an overhaul of – the reporting tools that are already a part of management control. It opens the door to company management truly attuned to performance and risk.

Annex: Econometric Techniques

Econometric techniques, to which we turn here, rely on the identification of a “long-term relationship” between variables of interest (turnover, net pretax earnings, etc.) and risk factors. This linear relationship is written⁸ in our example as a function of turnover:

$$CA_t = \alpha + \beta_1 X_{1t} + \beta_2 X_{2t} + \delta E_t + Z_t$$

To make things simple, this function is valid if variable Z is “stationary,” which means that turnover changes over time “around” its underlying “value” represented by $\alpha + \beta_1 X_{1t} + \beta_2 X_{2t} + \delta E_t$.

Z is not a “white noise,” although the sources of the deviation are sufficiently offset over time so that there is a “restoring force” toward underlying equilibrium. This is written by way of a second relationship reckoned econometrically, called a “short-term equation”:

$$\Delta CA_t = a + c \Delta CA_{t-1} + b_1 \Delta X_{1t} + b_2 \Delta X_{2t} + d \Delta E_t - \gamma Z_{t-1}$$

Such models are called “Error Correcting Model”

The Δ s symbolize the differences between dates. The “restoring force” or “Error Correction Mechanism” is expressed by the last term; a positive Z (in t-1, turnover is above its underlying value) will negatively impact variation in turnover in t.

It should be noted that the coefficients are not necessarily all significantly different from zero: in order to simplify things, we have not included time lags in the explanatory variables; occasional indicator variables (specific events in a given month) or more structural⁹ indicator variables may have to be included. Of course, it is best to have a certain amount of experience in order to determine the right specifications.¹⁰ Still, the required tools are those of least ordinary squares regressions, available in Excel!

Yet more sophisticated specifications can improve on this linear version of things, particularly through time-varying-coefficients or even as dependant on other exogenous factors. These enhancements are nonetheless only rarely necessary to start off with.

⁷ It might in certain cases choose to hedge them (climatic derivatives, for example).

⁸ Most often we are dealing with logarithms of variables so that the difference between two periods can be interpreted as a growth rate.

⁹ Non-stationary econometrics with structural breaks identifies the existence of several “regimes” in the dynamics of variables of interest (See Bruneau, C., Duval-Kieffer, C., Nicolai, J.-P. “Managing Funds in the US Market: How to Distinguish between Transitory Distorsions and Structural Changes in the Stock Prices,” European Journal of Finance, 6, 146-162, Spring 2000).

¹⁰ Selection of variables, number of time delays, frequency, etc.