International Journal of Business and Management; Vol. 19, No. 2; 2024
ISSN 1833-3850 E-ISSN 1833-8119
Published by Canadian Center of Science and Education

# Post-Shock Budgeting: A Methodological Framework

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Received: January 18, 2024 Accepted: February 27, 2024 Online Published: March 15, 2024

doi:10.5539/ijbm.v19n2p171 URL: https://doi.org/10.5539/ijbm.v19n2p171

**Abstract**

Traditional budgeting approaches have been criticised and called into question as not being able to adapt to management dynamics and context-specific planning needs. This is especially the case when major crises occur, with increased forecast uncertainty as a result. Adaptive techniques such as rolling and continuous budgeting have been developed to address such concerns, though trade-offs between the resulting optimisation of the planning, control and performance evaluation functions exist. A key, though not exclusive, effect of crises is the likely nonlinearity of effects of unit prices which will tend to revert to the mean, or in other words, rebound and gradually converge to pre-shock levels or to a steady state. Aiming to fill this research gap, this study presents a methodological framework, framed within a survival analysis paradigm, which can be used for post-shock budgeting. Following a description of the mathematical properties and steps required for application, the framework is illustrated using a stylised example of operational budget with results being compared between linear and nonlinear price rebound trajectories. The presented framework is a relatively simple and flexible solution to the issue of post-shock budgeting which can be readily developed and adapted, therefore lending itself to a widespread use.

**Keywords:** budgeting, shock, flexibility, survival analysis, methodological framework

## 1. Introduction

Budgeting plays a pivotal role in the financial management of public and private organizations, serving as a crucial tool for planning, controlling, and evaluating performance (Zarei et al., 2022; Merchant and Van der Stede, 2017). Whereas being an important control system for most organisations (Hansen, 2011), dysfunctional consequences of budgetary controls have been documented and consequent dissatisfaction have motivated change in budgeting methods and practices (Alkaraan, 2020; Libby and Lindsay, 2010). One aspect of budgeting, however, complicates the development and evaluation of potentially alternative options. While a budgeting system can be used for several purposes, each organisation designs it based on its key priorities, for instance, to optimise operational planning or focus on performance evaluation (Hansen and Van der Stede, 2004). To this respect, calls for improving traditional budgeting processes have highlighted a lack of budget uses for operational planning and strategy formation which, comparatively, have been neglected (Nguyen et al., 2018).

## 2. Literature Review and Research Objectives

Shocks can disrupt budgeting processes. Major shocks such as the Covid-19 pandemic introduce uncertainty, rendering traditional budgeting approaches less effective (OECD ,2002). In the wake of a shock, firms will have the choice of either set their budgets aside (Becker, 2014), or try and face the related uncertainty by adopting more flexible and adaptive budgeting practices that can rapidly respond to post-shock challenges. Indeed, the planning function of budgeting has been found to grow more prominent in volatile economic environments (Henttu-Aho, 2018), with firms addressing uncertainty by using scenario budgeting (Van der Stede and Palermo, 2011) or turning to more frequent forecasts and use of continuous (Frow et el., 2010) or rolling budgeting (Hansen, 2011). What these approaches have in common is an increased flexibility which, at least in part, addresses the non-stationary effects of shocks. Notwithstanding its utility, however, scholars have expressed concerns regarding the role of rolling forecasting, finding it problematic for planning and goal setting, compared to annual budgeting (Haka and Krishnan, 2008).

Whether it be for reactive or proactive management control styles (Palermo, 2018), having a systematic budget mechanism by which an organisation can be forward-looking and integrate forecast data and information may be important, especially yet not exclusively, in the wake of a crisis. Indeed, technological advances in monitoring, the availability of big data, and artificial intelligence-based predictive modelling (Gusc et al., 2022) all support a new direction. In order to accommodate this, innovative budgeting practices may involve the incorporation of statistical methods to model the time-dependent effects of shocks on budgeting variables. However, a challenge quite remains in striking a balance between the potentially more accurate and real-time information available nowadays and the cost of adopting more sophisticated budget modelling techniques and consequently their probability of implementation in practice, especially for not highly capitalised firms (Sandalgaard and Nielsen, 2018; Karadag, 2015).

Against this backdrop, this paper aims to fill this gap by presenting a methodological framework that enables the modelling of nonlinear effects of major shocks on budgets. Framed within a survival analysis paradigm, the mathematical structure of the framework is first presented and then illustrated using a stylised example in operating budgets. The applicability and limitations of the proposed framework are subsequently discussed, with a final section putting forward some concluding remarks.

## 3. Methodological Framework

Let us consider an annual cost budget calculated using a marginal costing approach, as follows:

$$Y = \beta_0 + \beta_1 X + e$$

where *Y* is the total cost, *X* is the weighted sum of different sources of *variable* resource use ($x_1$, $x_2$, $x_3 \ldots x_n$) expressed in natural units, $\beta_1$ (slope) represents the weighted sum of respective unit costs, $\beta_0$ (intercept) represents the total fixed costs which as a unit price component, as well as a resource use component which does not change with production volume, and *e* is the random error term. To reflect semi-variable cost behaviour patterns, X may take any given functional form as it is commonly applied for flexible budgeting (Proctor, 2012).

In traditional budgeting, the annual budget is typically prepared by taking the current period's budget or actual performance as a base, with incremental amounts (e.g., +25%) then being *added* for the new budget period based on inflation and a qualitative assessment of the relevant market conditions and dynamics (de Campos and Rodrigues, 2016). These adjustments will therefore correspond to increased unit prices of $\beta_0$ and within $\beta_1$ (together identified thereinafter as ϐ). In graphical terms, this can be simply viewed as shifting the variable cost line up (increased $\beta_0$) and increasing its slope ($\beta_1$).

### 3.1 Post shock trajectories

Whereas under stationary conditions, an *additive* incremental budgeting approach will arguably be adequate to ensuring a sufficient level of forecast accuracy for the next period, this may not be the case when a systemic shock, such as Covid-19 or an energy crisis, occurs. Due to the shock, prices will likely change their natural course by sharply rising or dropping, to then rebound gradually, fully or at least to some degree, to baseline levels reflecting the economic conditions that prevailed before the shock (Palepu et al., 2022).

From a statistical perspective, this translates into any shock-induced effect on price unlikely to remain constant over time, that is, with rebound trajectories likely being *nonlinear* in the parameter ϐ. To accommodate such effects, alternative computational models and a shift from additive to *multiplicative* approaches will be required.

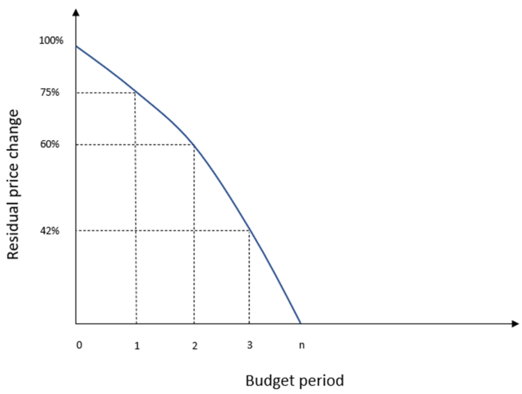


Figure 1. Hypothetical residual price change (Δ ϐ) over time - downward rebound trajectory

For ease of argument, taking a (monotonic) downward rebound after a shock occurred in the budget period t-1 which caused an abnormal rise in prices, the nonlinear price *change* trajectory can be conceptualised using the principles of survival analysis (Singer and Willett, 1993). Thus, viewing the shock-induced effect through the lens of a survival function, where the effect decay is a cumulative distribution function (that is, a non-decreasing hazard function, H) and 1-H is a survival function, where survivorship is the residual shock-induced effect on б up to a certain point in time - as that depicted in Figure 1.

The assumed rebound period is partitioned into equal post-shock time intervals corresponding to as many budget periods (t=n, e.g., years or quarters). At time t=0, 100% of the shock-induced change is in effect. As time progresses, the shock-induced effect (i.e., change in price) starts converging gradually towards zero - in this stylised example at time=4. At the beginning of t=1, 25% is decayed, or in other words, 75% of the original effect magnitude is retained. At the subsequent budget period, 40% of the initial effect has faded out, corresponding to a 15% absolute difference from the previous period, equivalent to a 20% (15/75) *incremental* loss. This process ends when no residual price change effect is left and the price returns to its expected pre-shock value and the process becomes stationary. To compute the residual intervention effect at any given budget period, three steps need to be followed. First, choosing among the large family of exponential functions, a parametric survival model of the likely price rebound trajectory needs to be estimated based on relevant price data or using expert elicitation methods (Bojke et al., 2021).

The estimated rates of decay (λ) are then computed for the cycles elapsed up to cycle n. Taking an example of decay of effect between two time points (u-1 and u), these decay rates require to be converted into probabilities using the following formula (Briggs et al., 2006):

$$p\lambda i\ (u-1, u) = 1-\exp[H(u-1) - H(u)]$$

where, H(u) = cumulative hazard at cycle n. For example, if a Weibull distribution is assumed for the hazard:

$$H(u)=\lambda i(u)\ \gamma:\ p\lambda i\ (u-1, u) = 1-\exp[\lambda i(u-1)\ \gamma-\lambda i(u)\ \gamma]$$

Probability formulas for other statistical distributions are shown in **Appendix I**. From the general formulation (equation 1.3), to calculate the probability of residual effect – that is the *survival probability* - , from the previous budget period:

$$p_{res}(u-1,u) = 1 - p\lambda i\ (u-1,u)$$

Hence, the general formulation for calculating the probability of residual intervention effect left up to cycle u from time t=0:

$$P_{0,u}^{res} = \prod_0^u \left(p_i^{res}(t,u)\right)$$

In other words, a multiplication of the survival probabilities from time t up to cycle u is needed. Using the example in Figure 1, once $P_{0,u}^{res}$ is computed, for example, for u=3 (i.e., $P_{0,u}^{res} = 0.42$), the residual intervention effect for time 3 is obtained by multiplying the intervention effect (Δб) by each of the survival probabilities of residual effect $p_{res}$ up to cycle 3. Thus, a series of subsequent transition probabilities (from cycle t=0 to cycle u) incorporating the progressive loss of intervention effect over time can be represented using the following notation:

$$\theta^u = \theta^{u-1} * P(_{0,u-1}{}^{res})^{-1} * P(_{0,u}{}^{res})$$

where $\theta^{u-1} * P(_{0,u-1}{}^{res})^{-1} = \theta^0$, that is the post-shock price change (i.e., 100% of the effect). Therefore:

For budget period t=1 $\theta^1 = \theta^0 * P(_{0,1}{}^{res})$

For budget period t=2 $\theta^2 = \theta^1 * P(_{0,1}{}^{res})^{-1} * P(_{0,2}{}^{res})$

For budget period t=3 $\theta^3 = \theta^2 * P(_{0,2}{}^{res})^{-1} * P(_{0,3}{}^{res})$

And so on until t=n, and no residual effect is left, or a steady state is reached.

**4. Illustration**

To illustrate the proposed framework, let us consider a stylised example of an operating budget for the period pre shock. Company X ltd is a manufacturing firm that produces two goods, A and B, and a prepares quarterly budgets. For the current year, an EBIT of £2.1 million was budgeted, with trimesters contributing equally to the annual targets (Appendix I, Table A).

Let us imagine that in November, the cost of electricity sharply increased to due to a sudden energy crisis, affecting the budget estimates for the following year (post-shock annual and quarterly budgets). Following consultation, company managers concluded that 1) number of units sold and respective unit prices would not change from the current year and that 2) this shock would most likely affect the unit variable cost by a 100%

increase for both products A and B, as well as the fixed costs, with a £50,000 for product A and a £100,000 for product B.

In a first scenario, a straight-line rebound trajectory was assumed at a constant 25% coefficient through the budget year. In an alternative scenario, based on an expert elicitation exercise conducted to estimate the likely curvilinear rebound trajectory of energy price change for the following year, managers applied a nonlinear approach to budgeting. For this exemplificative exercise of nonlinear rebound, a Weibull distribution was fitted to data from a previously published tutorial (Candio, 2022) and adapted as appropriate ($\gamma = 2.302$, $\lambda = 0.017$). Though starting from the same data point (100% price change) at the beginning of the year, the two trajectories start diverging, reaching a maximum distance between one another at the end of the second quarter, to then slowly converging toward the zero value at the end of the year. Such difference in trend results in the assumed residual shock-induced effects on energy price being different particularly in the mid-section of the chart. The two trajectories are compared in Figure 2.

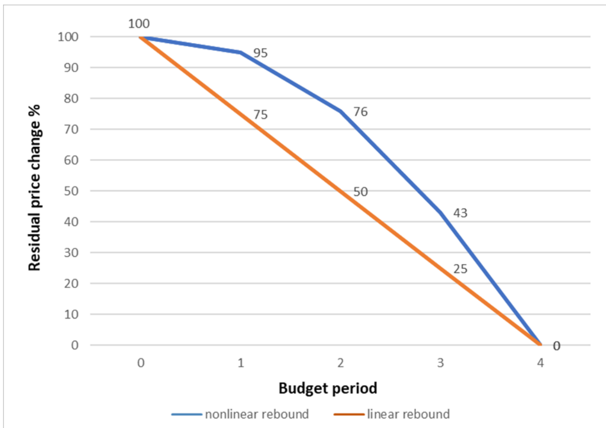


Figure 2. Linear vs nonlinear price rebound trajectories

Applying a half-cycle correction method (Barendregt, 2014), that is, assuming that the average within-period residual effect coincides with the mid-point, the estimated budgets under a 100% linear and nonlinear downward price rebound trajectories are shown in Appendix I, Table B and Table C, respectively. In the case of Company X, the choice between a linear and nonlinear price rebound trajectory results in the operational budget reaching an EBIT break-even point and expecting a £804,000 loss at the end of the following year, respectively.

Relative to the quarterly 25% straight-line assumption, the depicted nonlinear rebound has a positive differential effect on both fixed and variable costs. In terms of variable costs, an average annual deviation of 9.64% is calculated (£6,308,000 vs £5,700,000), with a peak of 13.79% at trimester III (£797,500 vs 687,500), for both products. As for fixed costs, the two scenarios differ by an average 1.30% (£7,396,000 vs £7,300,000), with a greater differential effect for product B – due to the proportionally higher expected increase in cost.

In terms of model implementation in MS Excel, following the example described in **Appendix I**, and starting from **Table A**, **Table B** and **Table C** are derived from respective changes in unit costs due to the effect induced by the systemic shock, as described in the paragraphs above. Following **Figure 2**, the initial 100% increment in price reaches 75% and 95% under a linear and non-linear rebound trajectory at the end of the II trimester, respectively. In the stylised case study presented, starting from a €10 baseline value, the price therefore stands at €18.75 and €19.75. These differential price values therefore affect the total variable costs which respectively amount at €937.500 and €987.500 for product 1, and at €843.750 and €888.750 for product 2, hence impacting the total budget.

## 5. Discussion

This paper is concerned with the issue of post-shock budgeting. To operationalise this computational approach, a methodological framework based on a survival modelling paradigm is proposed addressing key limitations of traditional linear assumptions in budgeting. To the best of knowledge, this framework fills an existing methodological gap complementing, rather than replacing, other flexible and adaptive budgeting techniques such as continuous, scenario and rolling budgeting.

While nonlinear trends in unit costs are particularly likely to follow major shocks, in principle, this framework can be used to address the limitation of linearity in other types of budgets and accounting domains (e.g., depreciation). The proposed framework provides ample flexibility to i) choose a plausible exponential distribution representing the likely rebound trajectory, ii) conduct scenario analyses aimed to adequately characterise the uncertainty surrounding resource allocation and planning decisions and iii) a formal modelling tool which can be parameterised and updated with relevant data to inform such decision making. Unlike integrated solutions and advanced modelling techniques, the proposed approach presents a relatively simple modelling solution and a small incremental change from current practice, not requiring high-level modelling or programming skills (it can be developed in Excel software (Microsoft Corporation, 2018). For this reason, it can lend itself to ready implementation and adaptation to different budgeting requirements and company contexts, hence with potential for widespread use.

The proposed framework is based on a survival parametric approach to allow for extrapolation of effects over time. Provided relevant data exists, however, it can be adapted to accommodate semi-parametric approaches such as Cox regression models as well (Harrell, 2001). The availability of relevant and reliable data remains, in fact, a challenge which this modelling solution cannot overcome directly. Nevertheless, by providing a formal modelling solution, it enables the application of a wide range of nonlinear assumptions and therefore statistical testing. Indeed, alternative sources of information on plausible rebound trajectories, either hypothetical distributions obtained from simulated data, or based on information elicited by experts can be used and tested using the framework.

While being based on a survival analysis approach and allowing for univariate or multivariate sensitivity analyses, the framework is essentially deterministic in the form it has been proposed. Indeed, it cannot reflect the uncertainty induced by the residual effect parameters used for extrapolation which would in fact require a probabilistic design. Furthermore, extrapolation of effects is made possible for one budget element and unit cost at the time, hence tiered prices cannot be modelled. However, this limitation could be addressed by extending the presented framework to matrix-based extrapolation approaches (Wang and Chen, 2017).

The present study described the functionality of the proposed methodological framework using a stylised example of budgeting for ease of illustration and future empirical research should consider applying the framework to different real-world settings to test its applicability across industries and managerial decision-making contexts. Furthermore, heterogeneity in non-stationary effects induced by the shock on multiple price levels and their interactions will inevitably increase computational and modelling complexity which in turn could deter model users from implementing more sophisticated, yet accurate analytical solutions. To this end, model averaging and simulation packages are available in the public domain which can be relatively readily incorporated in the development and adaptation of the proposed framework.

## 6. Conclusions

Formally modelling shock-induced nonlinear effects is important to enable more robust and realistic budgeting, and therefore efficient planning. The proposed modelling framework presents a simple solution to overcome some of the limitations of traditional linear paradigms and should be considered as a planning-support tool to complement other well-established budgeting techniques.

**Acknowledgements**

I would like to thank the colleagues at the University of Oxford for the useful feedback.

**Ethics approval**

The Publication Ethics Committee of the Canadian Center of Science and Education.

The journal and publisher adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

**Provenance and peer review**

Not commissioned; externally double-blind peer reviewed.

**Data availability statement**

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

**Data sharing statement**

No additional data are available.

**Open access**

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## Appendix I

Table A. Company X pre-shock operating budget

| **ACCOUNT NAME** | **I trimester** | **II trimester** | **III trimester** | **IV trimester** | **Total** |
|---|---|---|---|---|---|
| **Volume** | | | | | |
| [Product 1] | 50,000 | 50,000 | 50,000 | 50,000 | 200,000 |
| [Product 2] | 75,000 | 75,000 | 75,000 | 75,000 | 300,000 |
| **Price per Unit** | | | | | |
| [Product 1] | £ 45.00 | £ 45.00 | £ 45.00 | £ 45.00 | £ 45.00 |
| [Product 2] | £ 25.00 | £ 25.00 | £ 25.00 | £ 25.00 | £ 25.00 |
| **Revenue** | | | | | |
| [Product 1] | £ 2,250,000 | £ 2,250,000 | £ 2,250,000 | £ 2,250,000 | £ 9,000,000 |
| [Product 2] | £ 1,875,000 | £ 1,875,000 | £ 1,875,000 | £ 1,875,000 | £ 7,500,000 |
| **Total Revenue** | **£ 4,125,000** | **£ 4,125,000** | **£ 4,125,000** | **£ 4,125,000** | **£ 16,500,000** |
| **Unit costs** | | | | | |
| [Product 1] | £ 10.00 | £ 10.00 | £ 10.00 | £ 10.00 | £ 10.00 |
| [Product 2] | £ 6.00 | £ 6.00 | £ 6.00 | £ 6.00 | £ 6.00 |
| **Total Variable Costs:** | | | | | |
| [Product 1] | £ 500,000 | £ 500,000 | £ 500,000 | £ 500,000 | £ 2,000,000 |
| [Product 2] | £ 450,000 | £ 450,000 | £ 450,000 | £ 450,000 | £ 1,800,000 |
| **Total Variable Costs** | **£ 950,000** | **£ 950,000** | **£ 950,000** | **£ 950,000** | **£ 3,800,000** |
| **Contribution Margin** | **£ 3,175,000** | **£ 3,175,000** | **£ 3,175,000** | **£ 3,175,000** | **£ 12,700,000** |
| **Less Fixed Costs:** | | | | | |
| [Product 1] | £ 1,000,000 | £ 1,000,000 | £ 1,000,000 | £ 1,000,000 | £ 4,000,000 |

| | | | | | |
|---|---|---|---|---|---|
| [Product 2] | £ 750,000 | £ 750,000 | £ 750,000 | £ 750,000 | £ 3,000,000 |
| **Total Fixed Costs** | **£ 1,750,000** | **£ 1,750,000** | **£ 1,750,000** | **£ 1,750,000** | **£ 7,000,000** |
| **Net Operating Margin** | **£ 1,425,000** | **£ 1,425,000** | **£ 1,425,000** | **£ 1,425,000** | **£ 5,700,000** |
| **Depreciation & Amortisation** | | | | | |
| [Depreciation] | £ 250,000 | £ 250,000 | £ 250,000 | £ 250,000 | £ 1,000,000 |
| [Amortisation] | £ 150,000 | £ 150,000 | £ 150,000 | £ 150,000 | £ 600,000 |
| **Other Expenses** | | | | | |
| [Other Cost 1] | £ 500,000 | £ 500,000 | £ 500,000 | £ 500,000 | £ 2,000,000 |
| **Depreciation and Other Expenses** | **£ 900,000** | **£ 900,000** | **£ 900,000** | **£ 900,000** | **£ 3,600,000** |
| **EBIT** | **£ 525,000** | **£ 525,000** | **£ 525,000** | **£ 525,000** | **£ 2,100,000** |

Table B. Company X post-shock operating budget – linear rebound

| **ACCOUNT NAME** | **I trimester** | **II trimester** | **III trimester** | **IV trimester** | **Total** |
|---|---|---|---|---|---|
| **Volume** | | | | | |
| [Product 1] | 50,000 | 50,000 | 50,000 | 50,000 | 200,000 |
| [Product 2] | 75,000 | 75,000 | 75,000 | 75,000 | 300,000 |
| **Price per Unit** | | | | | |
| [Product 1] | £ 45.00 | £ 45.00 | £ 45.00 | £ 45.00 | £ 45.00 |
| [Product 2] | £ 25.00 | £ 25.00 | £ 25.00 | £ 25.00 | £ 25.00 |
| **Revenue** | | | | | |
| [Product 1] | £ 2,250,000 | £ 2,250,000 | £ 2,250,000 | £ 2,250,000 | £ 9,000,000 |
| [Product 2] | £ 1,875,000 | £ 1,875,000 | £ 1,875,000 | £ 1,875,000 | £ 7,500,000 |
| **Total Revenue** | **£ 4,125,000** | **£ 4,125,000** | **£ 4,125,000** | **£ 4,125,000** | **£ 16,500,000** |
| **Unit costs** | | | | | |
| *[Product 1] +100%* | £ 18.75 | £ 16.25 | £ 13.75 | £ 11.25 | £ 15.00 |
| *[Product 2] +100%* | £ 11.25 | £ 9.75 | £ 8.25 | £ 6.75 | £ 9.00 |
| **Total Variable Costs:** | | | | | |
| [Product 1] | £ 937,500 | £ 812,500 | £ 687,500 | £ 562,500 | £ 3,000,000 |
| [Product 2] | £ 843,750 | £ 731,250 | £ 618,750 | £ 506,250 | £ 2,700,000 |
| **Total Variable Costs** | **£ 1,781,250** | **£ 1,543,750** | **£ 1,306,250** | **£ 1,068,750** | **£ 5,700,000** |
| **Contribution Margin** | **£ 2,343,750** | **£ 2,581,250** | **£ 2,818,750** | **£ 3,056,250** | **£ 10,800,000** |
| **Less Fixed Costs:** | | | | | |
| *[Product 1] +£50,000* | £1,043,750 | £1,031,250 | £1,018,750 | £1,006,250 | £4,100,000 |
| *[Product 2] +£100,000* | £837,500 | £812,500 | £787,500 | £762,500 | £3,200,000 |
| **Total Fixed Costs** | **£ 1,881,250** | **£ 1,843,750** | **£ 1,806,250** | **£ 1,768,750** | **£ 7,300,000** |
| **Net Operating Margin** | £ 506,250 | £ 768,750 | £ 1,031,250 | £ 1,293,750 | £ 3,600,000 |
| **Depreciation & Amortisation** | | | | | |
| [Depreciation] | £ 250,000 | £ 250,000 | £ 250,000 | £ 250,000 | £ 1,000,000 |
| [Amortisation] | £ 150,000 | £ 150,000 | £ 150,000 | £ 150,000 | £ 600,000 |
| **Other Expenses** | | | | | |
| [Other Cost 1] | **£ 500,000** | **£ 500,000** | **£ 500,000** | **£ 500,000** | **£ 2,000,000** |
| **Depreciation and Other Expenses** | **£ 900,000** | **£ 900,000** | **£ 900,000** | **£ 900,000** | **£ 3,600,000** |
| **EBIT** | **(393,750)** | **(131,250)** | **131,250** | **393,750** | **0** |

Table C. Company X post-shock operating budget – nonlinear rebound

| ACCOUNT NAME | I trimester | II trimester | III trimester | IV trimester | Total |
|---|---|---|---|---|---|
| **Volume** | | | | | |
| [Product 1] | 50,000 | 50,000 | 50,000 | 50,000 | 200,000 |
| [Product 2] | 75,000 | 75,000 | 75,000 | 75,000 | 300,000 |
| **Price per Unit** | | | | | |
| [Product 1] | £ 45.00 | £ 45.00 | £ 45.00 | £ 45.00 | £ 45.00 |
| [Product 2] | £ 25.00 | £ 25.00 | £ 25.00 | £ 25.00 | £ 25.00 |
| **Revenue** | | | | | |
| [Product 1] | £ 2,250,000 | £ 2,250,000 | £ 2,250,000 | £ 2,250,000 | £ 9,000,000 |
| [Product 2] | £ 1,875,000 | £ 1,875,000 | £ 1,875,000 | £ 1,875,000 | £ 7,500,000 |
| **Total Revenue** | **£ 4,125,000** | **£ 4,125,000** | **£ 4,125,000** | **£ 4,125,000** | **£ 16,500,000** |
| **Unit costs** | | | | | |
| *[Product 1] +100%* | *£ 19.75* | *£ 18.55* | *£ 15.95* | *£ 12.15* | *£ 16.60* |
| *[Product 2] +100%* | *£ 11.85* | *£ 11.13* | *£ 9.57* | *£ 7.29* | *£ 9.96* |
| **Total Variable Costs:** | | | | | |
| [Product 1] | £ 987,500 | £ 927,500 | £ 797,500 | £ 607,500 | £ 3,320,000 |
| [Product 2] | £ 888,750 | £ 834,750 | £ 717,750 | £ 546,750 | £ 2,988,000 |
| **Total Variable Costs** | **£ 1,876,250** | **£ 1,762,250** | **£ 1,515,250** | **£ 1,154,250** | **£ 6,308,000** |
| **Contribution Margin** | **£ 2,248,750** | **£ 2,362,750** | **£ 2,609,750** | **£ 2,970,750** | **£ 10,192,000** |
| **Less Fixed Costs:** | | | | | |
| *[Product 1] +£50,000* | *£ 1,048,750* | *£ 1,042,750* | *£ 1,029,750* | *£ 1,010,750* | *£ 4,132,000* |
| *[Product 2] +£100,000* | *£ 847,500* | *£ 835,500* | *£ 809,500* | *£ 771,500* | *£ 3,264,000* |
| **Total Fixed Costs** | **£ 1,896,250** | **£ 1,878,250** | **£ 1,839,250** | **£ 1,782,250** | **£ 7,396,000** |
| **Net Operating Margin** | £ 352,500 | £ 484,500 | £ 770,500 | £ 1,188,500 | £ 2,796,000 |
| **Depreciation & Amortisation** | | | | | |
| [Depreciation] | £ 250,000 | £ 250,000 | £ 250,000 | £ 250,000 | £ 1,000,000 |
| [Amortisation] | £ 150,000 | £ 150,000 | £ 150,000 | £ 150,000 | £ 600,000 |
| **Other Expenses** | | | | | |
| [Other Cost 1] | **£ 500,000** | **£ 500,000** | **£ 500,000** | **£ 500,000** | **£ 2,000,000** |
| **Depreciation and Other Expenses** | **£ 900,000** | **£ 900,000** | **£ 900,000** | **£ 900,000** | **£ 3,600,000** |
| **EBIT** | **(547,500)** | **(415,500)** | **(129,500)** | **288,500** | **(804,000)** |


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