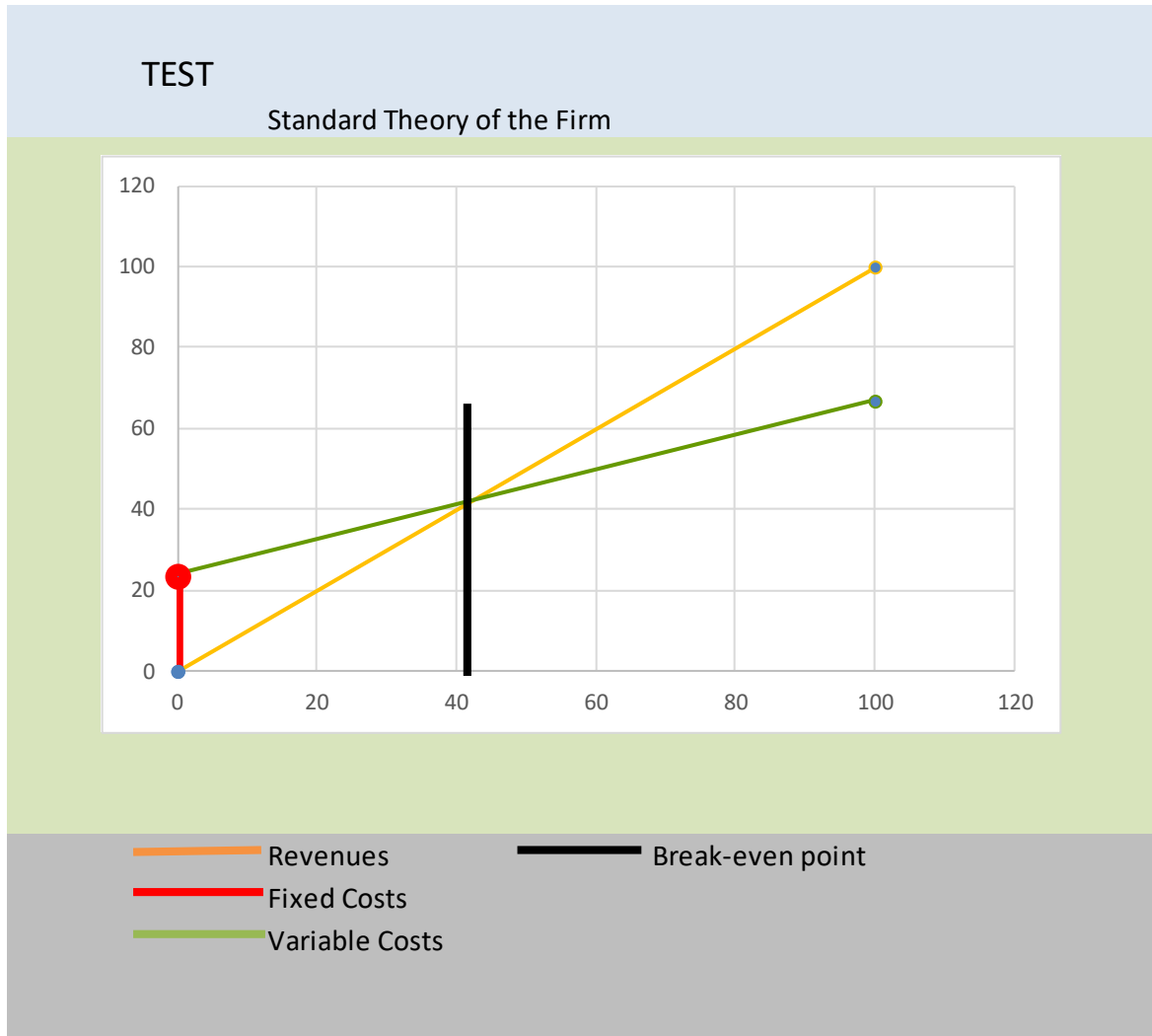


The Standard Theory of the Firm

In the standard theory, the only considerations in the model are revenues, fixed costs, variable costs, and output volumes. The model is illustrated in **Exhibit 1a**.

Exhibit 1a



Where the total cost line (comprising fixed and variable costs) cuts the revenue line is the break-even point between profits and losses. If, as illustrated in the model, the variable costs line has a lesser gradient than the revenue line then it is said that the marginal cost of production favours an expansion of volume.

However, this conclusion on marginal costs is only true when variable costs are linearly related to outputs.

The Theory of Marginal Costs

Suppose:

V is a $(1 \times n)$ vector of output volumes for n products.

$[A]$ is a $(n \times r)$ matrix of conversion costs for n products passing through r processes

Then:

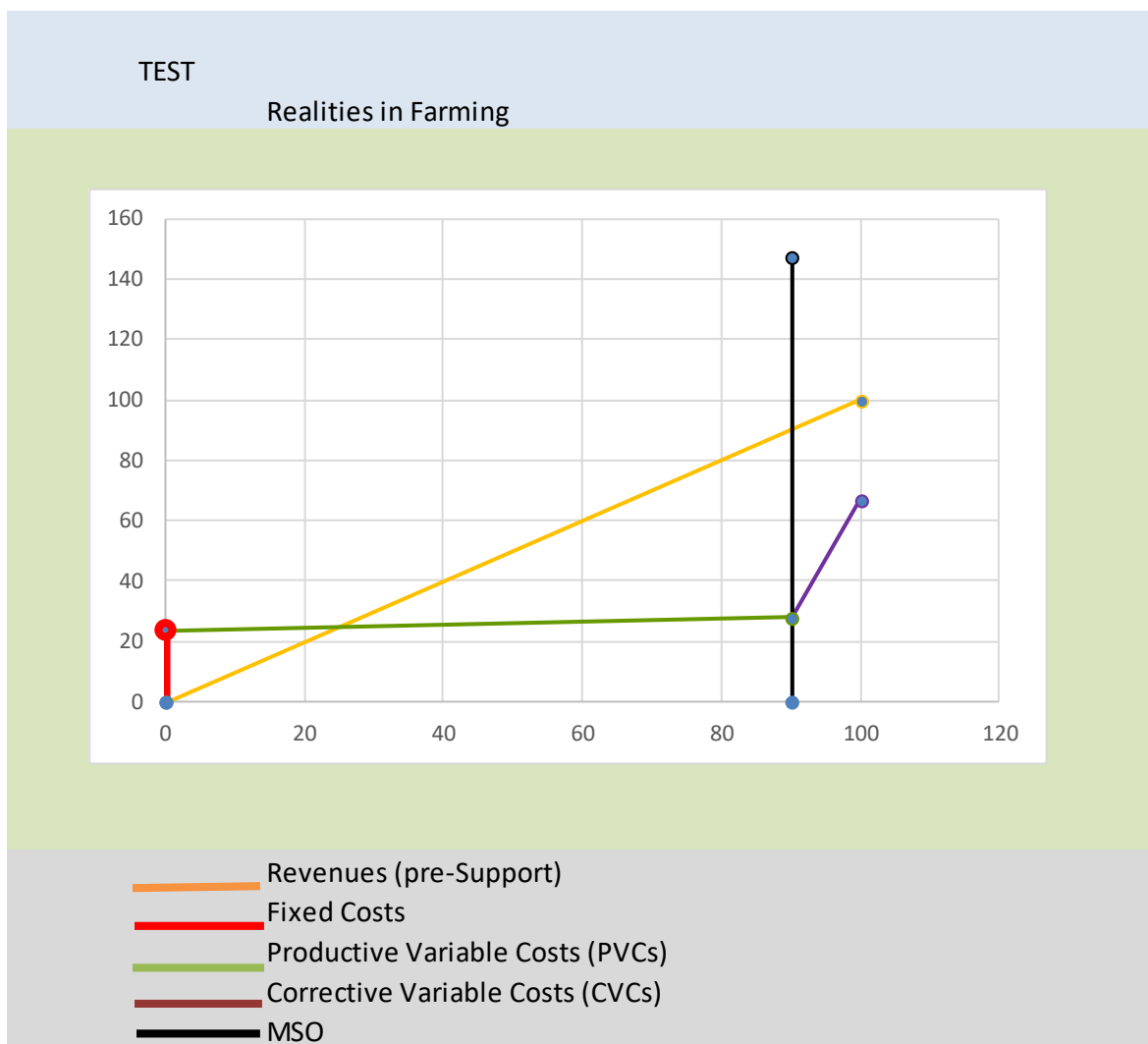
$V * [A] = C$ where C is a $(1 \times n)$ vector of total costs for n products

Now:

When $[A] * [A]^{-1} = [I]$ where $[I]$ is the unity matrix, then $[A]^{-1}$ is the matrix of marginal costs

This only holds true when the cells of $[A]$ are linear equations. If the cells are non-linear the matrix algebra has to be replaced by tensor algebra.

Exhibit 1b



The Realities of Farming and the MSO Model

In farming, variable costs fall into two (theoretically sequential) categories. These are:

1. Those incurred when working with Nature, defined as productive variable costs (PVCs)
2. Those incurred when substituting for Nature, defined as corrective variable costs (CVCs)

When this reality is accommodated the economic model changes to that illustrated in **Exhibit 1b**. The **Exhibits 1a** and **1b** relate to the same farm business, as evidenced by the final total variable cost being at the same point. Notice that:

1. The true break-even point comes at a lower level of output
2. If output continues to expand there will be a point of break-back into losses.

Test Farm Business

Exhibit 2

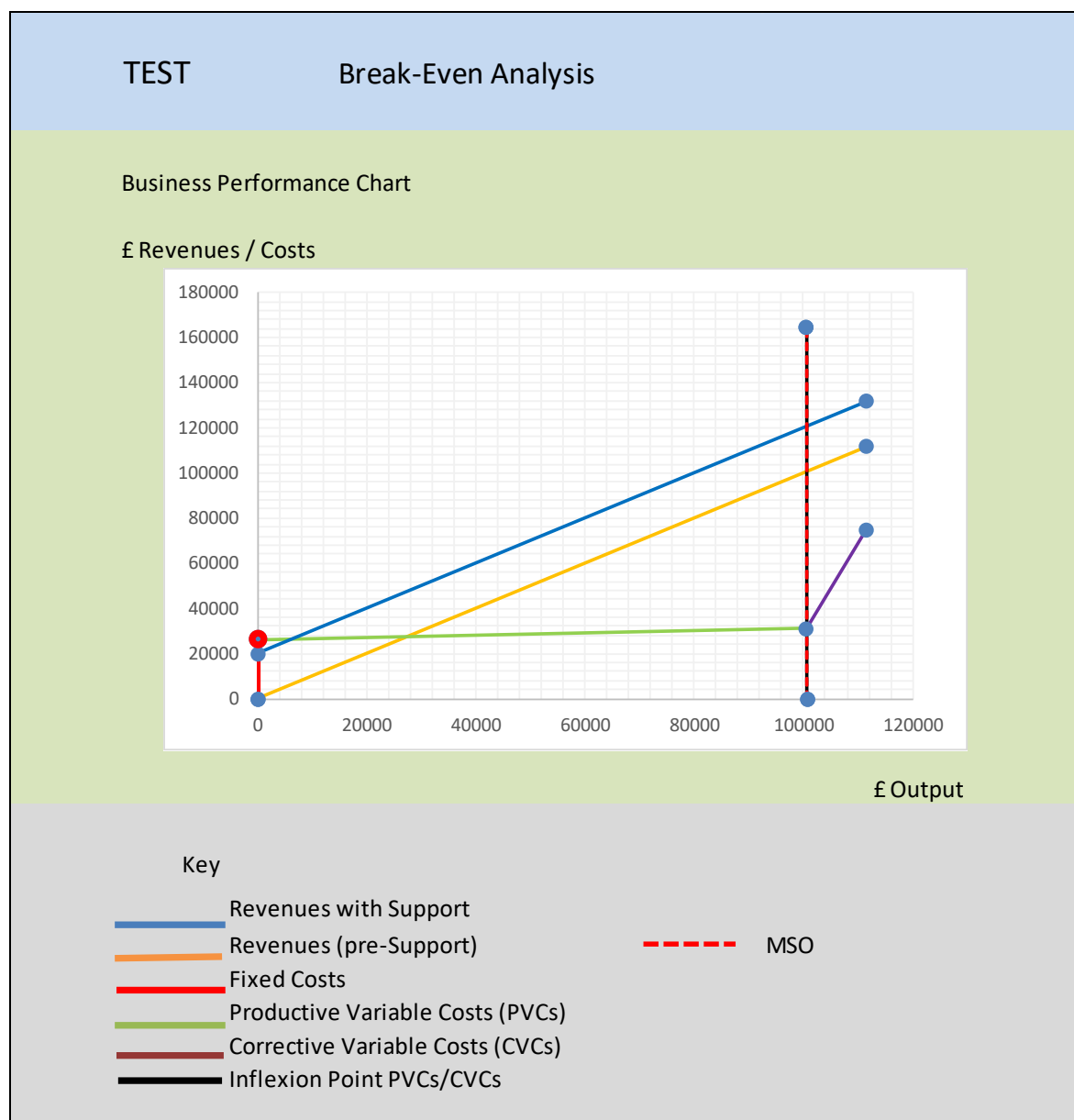


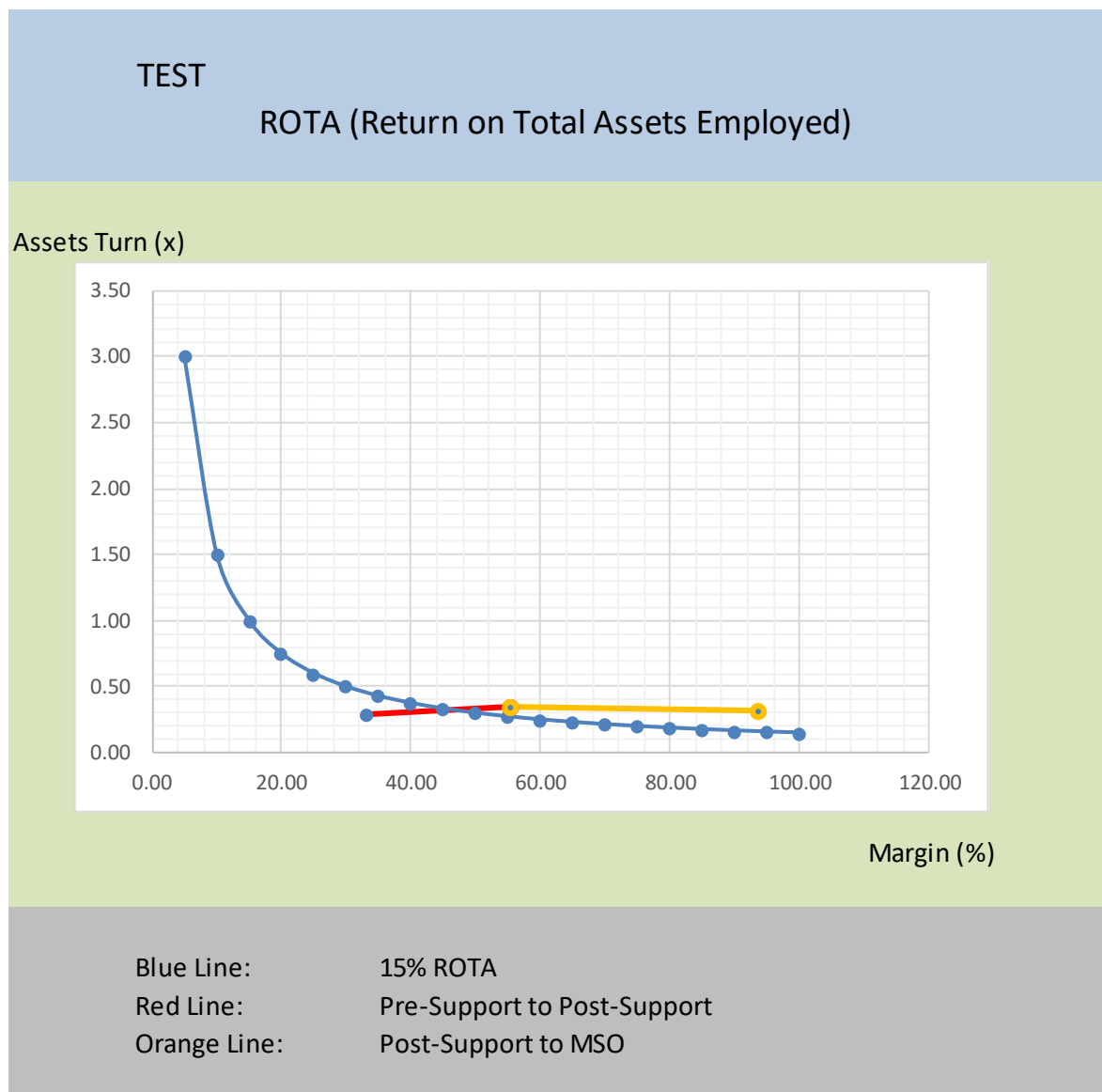
Exhibit 2 sets out the details of a farm business reflecting the MSO model. The inflexion point between the PVCs and the CVCs represents the position of **maximum sustainable output (MSO)** for the farm business. At the MSO point:

1. Profits are maximised
2. *Nature* is optimised for profit, being a pattern of bio-diversity un-adulterated by the artificial products that comprise CVCs

Returns On Total Assets-employed (ROTA)

The truest measure of performance in a business is return on total assets employed. This is the equivalent of a test rate of interest (such as the risk-free interest rate from a building society).

Exhibit 3



Suppose building society rates are 5%. Then a business may argue that to compensate for the inherent risks in its activities it should aspire to a 10% premium on a risk-free return. Such a business would set its ROTA objectives then at 15%.

Money is a two-dimensional vector that has amount and term. Inadequacies in the accounting profession to deal with vectors have led to the separation of accounts into two forms – the profit & loss account and the balance sheet.

Now:

$$\text{ROTA} = (\text{Profits})/(\text{Total Assets-employed})$$

This can be resolved into two components:

Profit Margin (PM) = (Profits)/(Sales), which relates to the P&L account, and

Assets Turn (AT) = (Sales)/(Assets-employed), which measures time (in days of sales) on the balance sheet.

Therefore, $\text{ROTA} = (\text{PM}) * (\text{AT})$ {This is the equation of an hyperbola ($x*y = K$)}

The ROTA curve for the test farm business is set out in **Exhibit 3**, showing the impact of support payments and in moving to MSO.

Non-Linear Variable Costs

To avoid the complications of tensor algebra, it is useful to avoid the marginal cost approach and focus on the evolutionary path of unit costs, when taking decisions about expansion.

This can be seen in **Exhibit 4**. The red line is the consequence of applying the standard model and the blue line the MSO model. These lines equate at the point of actual output but have very different implications. The red line would indicate expansion but the blue line would indicate a retreat to the minimum point (MSO) by eliminating CVCs.

Exhibit 4

