

# **MAKING DECISIONS BASED ON ECONOMICS, NOT ONLY PERFORMANCE**

**Robert Morrison**  
**University of Minnesota Swine Group**  
**385 Animal Science / Veterinary Medicine**  
**1988 Fitch Avenue, St. Paul, Minnesota 55108**  
**E-mail: bobm@umn.edu**

## **ABSTRACT**

In this paper, we review the importance of having financial records to supplement production records. We need financial records for reporting and monitoring our financial well-being, for managing our costs and profitability and for making decisions that will impact the business. In the presentation, we will review examples of each application of financial records.

## **INTRODUCTION**

A herd could be weaning 30 pigs/sow/year for an entire year and go broke. How? It could be a lack of inventory control, and therefore, too few sows bred, too few pigs weaned and fixed costs are spread over too few pigs. That is, the cost of production is too high. This is an example of a commonly accepted performance measure being overly simplistic and by itself, inadequate. We have adopted a second biologic measure to account for this inadequacy, and that is pigs weaned per week. We calculate the capacity of a sow facility and set a goal for throughput. This is a definite improvement. But I am guessing we all know farms where they are meeting throughput goals and yet are in financial trouble. In such a case, the problem may rest in the balance sheet, but might be made worse by income statement problems. That is, the cost of production could be too high and / or income too low, thereby increasing indebtedness on the balance sheet. So, while performance records are important to understand the biologic operation of the farm, financial records and their use in making decisions represent the “bottom line”.

## **FINANCIAL ACCOUNTING**

Financial accounting concerns the preparation of reports for use by persons inside and outside the farm. Outside of agriculture, these financial statements conform to generally accepted accounting principles (GAAP). These principles have evolved over time and have been made acceptable by two independent bodies – Financial Accounting Standards Board (FASB) and the Securities and Exchange Commission (SEC), an agency of the US federal government. The equivalent advisory group for smaller agricultural producers is the Farm Financial Standards Board (FSSB). The FFSB provides a national forum to facilitate the development, review, communication and promotion of uniformity and integrity in both financial reporting

and the analytical techniques useful for effective and realistic measurement of the financial position and performance.

Financial statements serve three important economic functions:

- They provide information to the owners and creditors of the farm about the current status and past financial performance.
- They provide a convenient way for owners and creditors to set performance targets and impose restrictions on the managers of the farm.
- They provide convenient templates for financial planning.

**Chart of Accounts** is used to classify data as it is accumulated in the general ledger for all financial reporting. The National Pork Board (NPB) recommends that producers keep at least the first level of accounts that include major income, expenses assets, liabilities and equity categories. The chart of accounts can be taken to three basic levels of production – breeding / gestation, nursery, finishing.

**1. Balance Sheet** – presents a snapshot at a point in time

- Assets- items that have the ability or potential to provide future benefits to the firm. For example, cash, inventory and equipment.
    - Current = cash and convertible within 1 year
    - Non current = Property, plant & equipment (PPE)
      - = cost - depreciation
  - Liabilities – creditors’ claims on the assets of the firm
    - Current – due within 1 year
    - Non current
  - Equity or net worth – is the difference
    - Paid in capital – funds invested by shareholders for an ownership interest
    - Retained earnings – earnings realized by the firm; assets reinvested in the firm
- Assets = Liabilities + Shareholders’ equity
- Market Value vs. Book (cost) Value. With GAAP, long term assets are valued at cost & depreciated over time (market valuations are allowed as supplemental information, but its accuracy is not commented on). Farm financial statements will give both cost and market value. Cost represents the purchase price minus accumulated depreciation. Market value is the value of the asset on the open market minus any selling commissions and potential taxes due to capital gains.

**2. Income Statement** - Has three parts

- Revenue (pig sales and other pork revenues)
  - Expenses (feed, labor, utilities, vet, etc),
  - Profit (production profit, operating profit and net income)
- Represents the results of operating activities for a period of time. The income statement links the balance sheet at the beginning to the balance sheet at the end of the period of time. Net income usually does not equal net cash flow.

- Accounts can be kept as accrual (recorded as production occurs or as expenses are committed) as or cash (recorded when received or paid, except for machinery, equipment of breeding stock which can be depreciated over time). Accrual more accurately reflects income generated during the period.
- Two forms of income are generally used. Gross revenues or value of farm production (VFP). Difference is how items purchased and held for subsequent sale are handled. In the gross revenue version, costs of these items are treated alike and listed with other operating costs. In the VFP version, costs of these items are subtracted from gross revenue to estimate the value added by farm after accounting for the purchase price of these items.

### **3. Cash Flow Statement**

This statement shows cash flow into and out of the farm during a period of time. It is a useful supplement to the income statement because it focuses attention on the farm's cash position, and does not require judgment on what is a revenue item versus an expense (only cash flow). It shows how operations affected cash for the period. It has 3 sections.

- Operating activities
  - Cash inflows – cash outflows
- Investing activities
- Financing activities
  - Dividends, new loans

**4. Supporting Schedules and Notes** – for large enterprises

**5. Auditor's Opinion** – for large enterprises.

## **ANALYSIS USING FINANCIAL RATIOS**

Analysts use financial ratios as one mode of analysis to better understand the farm's strengths and weaknesses, whether its fortunes are improving, and what its prospects are. These ratios are often compared with the ratios of a comparable set of companies and to ratios of recent past periods. The five types of ratios are profitability, turnover, financial leverage, liquidity, and market value ratios. Finally, it is helpful to organize the analysis of these ratios in a way that reveals the logical connections among them and their relation to the underlying operations of the firm.

Five measures of a farm's performance:

#### 1. Profitability

- use assets or equity as the denominator; use average of beginning and ending value for denominator.
- Return on Assets (ROA) = Earnings Before Interest and Tax (EBIT) / Total Assets (avg.)
- Return on Equity (ROE) = Net income / Equity (avg.)

2. Asset performance
  - farm's ability to use the assets
  - Asset turnover = Sales / Avg. Total Assets
3. Financial leverage (solvency)
  - a farm's capital structure and debt burden
  - Debt ratio = Total debt / Total assets
  - Interest Coverage = EBIT / Interest expense
4. Liquidity
  - a farm's ability to meet short term obligations and remain solvent
  - Current ratio = current assets / current liabilities
  - Quick or Acid test = (Cash + receivables) / Current liabilities
  - Working capital = Current assets (CA) – Current liabilities (CL)
5. Market value ratios
  - Used for publicly traded firms.
  - PE = Price per share / earnings per share
  - Market to Book = Price per share / Book value per share

**Farm Standards to compare to (from Lee Fuchs at AgStar):**

<b>Profitability</b>	<b>Good</b>	<b>Moderate</b>	<b>Poor</b>	
ROE	>15%	8-15%	<8%	NI / Avg total equity
ROA	>10%	6-10%	<6%	(NI + Int) / Avg total assets
Operating profit margin	>9%	4-9%	<4%	(NI + Int) / Gross revenues
Net profit margin	>6%	3-6%	<3%	NI / Gross Revenues
<b>Solvency</b>				
Term debt / equity	<60%	60-100%	>100%	(Tot liab - curr liab) / Tot equity
Adjusted debt / equity	<150%	150-200%	>200%	(tot liab - subord debt - deferred taxes) / Eq
<b>Liquidity</b>				
Current ratio	>1.5	1.2-1.5	<1.2	current assets / current liab
Working capital/gross revenues	>20%	5-20%	<5%	Work cap / gross rev
Working capital / sow	>\$400	\$100-400	<\$100	Work cap / # sows
Interest Coverage	>4.0	2.0-4.0	<2.0	(NI + deprec + Int + taxes) / Interest
<b>Farm performance</b>				
Asset turnover	>.9	.6-.9	<0.6	Gross rev / Total assets
Depreciation / cwt	<\$4.00	\$4-5.00	>\$5.00	Deprec / cwt sold
Interest, lease & rent cost / cwt	<\$5.00	\$5-6.00	>\$6.00	(Int + lease + rent exp) / cwt
Labor cost / cwt	<\$4.00	\$4-6.00	>\$6.00	Labor / cwt
Feed Cost / cwt	<\$22.00	\$22-25.00	>\$25.00	Feed exp / cwt
Breakeven	<\$38.00	\$38-42	>\$42.00	All accrued exp / cwt

## RATIO ANALYSIS

Return on equity (ROE) is the ultimate measure of economic return of an investment. This is because ROE reflects the financial return on the amount the owners have invested. ROE can be compared to other potential investments of similar risk to determine if the return is adequate.

Return on Equity has three determinants

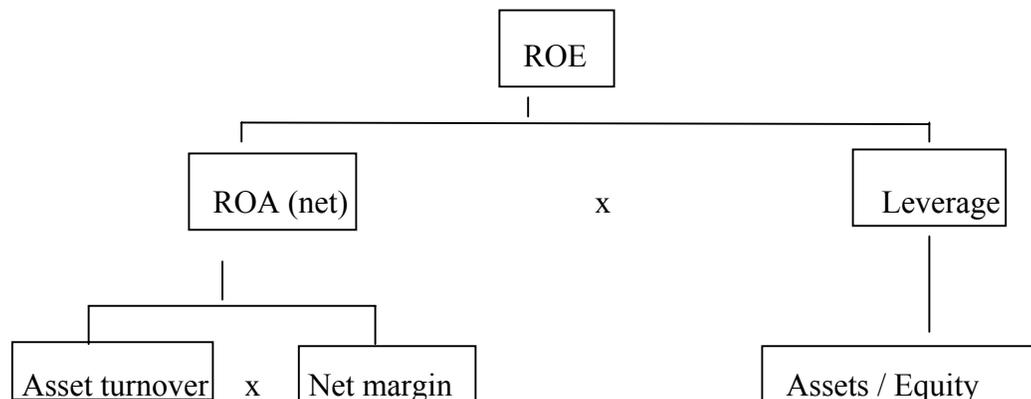
- Return on invested capital (composed of net fixed assets + working capital)
- Use of financial leverage (Interest Bearing Debt / Equity)
  - relative amount of debt
  - interest rate
- Tax policy

Note that effective use of leverage occurs when return on invested capital exceeds cost of debt (interest rate). There is a balance between increased risk when using debt financing & increased potential profitability.

Return On Assets (ROA) is a measure of how well the business is functioning independent of how it is financed. Use of debt (leverage) is a function of how one chooses to finance the business.

The ROE model was first developed and used in the early 1920s at the DuPont Corporation as a tool to help them manage their business. Accordingly, it is often referred to as the DuPont formula or the DuPont system of financial management. Since its early use at DuPont, it has become a commonly used tool in the non-agricultural business arena.

**Figure 1. The Return on Equity Model.**



Businesses are driven by the desire to maximize ROE, which in turn means maximizing ROA and optimizing leverage. ROA can be expressed as before tax (gross ROA) or after tax (Net ROA). Net ROA is a function of after-tax profit margin and asset turnover and is also referred to as the Return on Investment (ROI). The goal is to maximize ROA by effectively

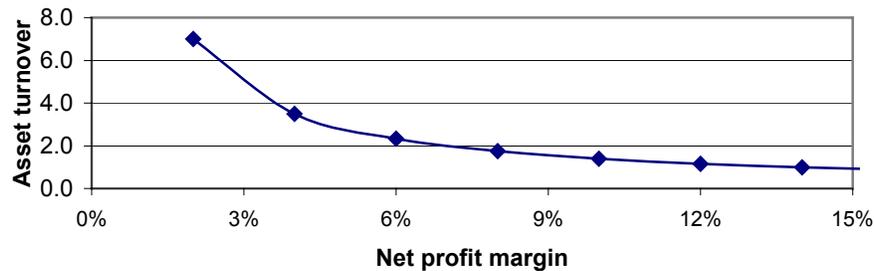
managing and balancing profit margin and asset turnover. Simplistically speaking, there are two extremes within the business world - firms with low margin per unit and high asset turnover (grocery stores) vs. firms with high margin per unit and low asset turnover (Boeing aircraft).

Consider a business with annual sales of \$1,000,000, asset value of \$500,000, and a net profit margin after tax of 7%. This would give the business a ROA for the year of 14%.

$$\begin{aligned}
 \text{ROA (net)} &= \text{asset turnover} \times \text{net profit margin} \\
 &= (\text{total sales} / \text{asset value}) \times \text{net profit margin} \\
 &= (\$1,000,000 / \$500,000) \times 7\% \\
 &= 14\%
 \end{aligned}$$

The strength of the model is that it helps the owner/manager understand the importance of managing profit margin at the same time as asset turnover (throughput). The manager can also appreciate that it is possible to trade margin for turnover and maintain the same ROA (see Figure 2 and Table 1 below). Pork producers intuitively use the DuPont formula when making management decisions. Examples include changing wean age, feeding strategy and market weight.

**Figure 2. Asset turnover and net profit margin of 14% ROA.**



**Table 1. Effect of net profit margin (%) and asset turnover on return on assets (%).**

Margin	Asset Turnover Ratio							
	0.25	0.5	0.75	1	1.25	1.5	1.75	2
2%	0.5%	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%
4%	1.0%	2.0%	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%
6%	1.5%	3.0%	4.5%	6.0%	7.5%	9.0%	10.5%	12.0%
8%	2.0%	4.0%	6.0%	8.0%	10.0%	12.0%	14.0%	16.0%
10%	2.5%	5.0%	7.5%	10.0%	12.5%	15.0%	17.5%	20.0%
12%	3.0%	6.0%	9.0%	12.0%	15.0%	18.0%	21.0%	24.0%
14%	3.5%	7.0%	10.5%	14.0%	17.5%	21.0%	24.5%	28.0%
16%	4.0%	8.0%	12.0%	16.0%	20.0%	24.0%	28.0%	32.0%
18%	4.5%	9.0%	13.5%	18.0%	22.5%	27.0%	31.5%	36.0%
20%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%

To improve ROA, the manager needs to improve margin, turnover or both. Margin can be improved by:

- cutting costs, both variable and fixed,
- increasing per unit sales price (eg. quality or quantity premium, futures).

Turnover can be increased by:

- increasing sales volume,
- disposing of obsolete or unneeded inventory,
- identifying and dispose unused fixed assets, and
- speeding up collection of receivables; evaluate credit terms.

## **Examples**

All over the world, banks' traditional business of taking deposits and lending out the proceeds is in terminal decline. US banks have 28% of the financial services market, half of what they had 20 years ago. While traditional sources of revenue are down, margin has also decreased from average 5.5% to 4% in the same time. In Germany also, banks' margin on lending has declined from 2-3% to just over 1%. Shareholders expect 15-20% return on the business' ROE, so what is a banker to do?

Looking at the ROE model, we see that cutting costs is one way of improving return. Cost cutting is one reason why the number of banks has decreased from 14,500 to 9,000 in the last 15 years in the US as mergers and consolidation eliminates inefficiencies. Consolidation in Europe and Japan will be more difficult because there are more state-owned banks. A second response is to increase revenues from alternative sources such as investment banking (fees and commission income) and/or lending to less credit-worthy customers. With the same efficiency of business management, an owner can increase ROE by taking on more debt. Therefore, a third response would be to take on more debt; that is, to borrow a higher percentage of total assets. As long as the gross return on asset is higher than the after-tax cost of debt, debt is being "effectively used". However, internationally active banks are not allowed to have less than 8% of total assets as equity; that is, they have a limit on the leverage they can have.

A second example is the personal computer industry. Profit margin is under extreme pressure and average price is expected to drop by a further 14% this year as the desktop computer has become a commodity. These low profits partly reflect over-capacity and competition for market share (sounds familiar!). Look at the ROE tree and consider the options. Computer firms are responding by becoming more cost-efficient (Dell), selling novel designs to capture higher price (Apple), seeking additional sources of revenues by offering other electronic goods (Gateway) or services (IBM), or considering whether they should be in a commodity business at all (Hewlett Packard). Companies that do not excel in efficient production or added-value services and sales are caught in between and are in major trouble (former Compaq).

## Effective Use of Leverage

As stated above, ROE is a function of three major drivers; return on assets, use of debt (leverage) and taxes. A firm may also increase ROE by increasing ROA, but also by increasing the percentage of total assets financed by debt. This third component of the ROE tree is sometimes referred to as the equity multiplier (assets / equity). Increasing debt will increase the ROE as long as the gross ROA exceeds the cost of the debt. However, as debt increases, the risk position of the enterprise also increases.

Effective use of financial leverage is a management practice that many producers, and their lenders, have not mastered. In agriculture, the commodity risk that results from large variance in cash flow and profitability typically causes the belief that use of debt is not conducive to profitability. Agricultural lenders tend to be more conservative than non-agricultural lenders because of this large variance in producers' cash flows.

It is important to understand that use of debt, up to a point, is, in fact, conducive to profitability. But the proper measure of profitability should be in terms on ROE, which is where the DuPont Model again becomes very useful. Also, what makes debt conducive to profitability is that debt is a cheaper form of capital than equity. But again, up to a point. All capital is either debt capital or equity capital. And debt capital is cheaper (all else being equal) because the interest payments on debt are tax deductible. Also, payments on debt take priority over payments on equity so risk to the lender is typically less than the risk to the owner.

Therefore, use of debt is cheaper than equity as long as the risks to the lender are not so great that the lender requires a premium (higher rates to generate higher returns) to have the incentive to make the loan. This is the risk - reward trade-off. But if the debt levels are too high and/or profitability is highly volatile (and there is a correlation between low equity and volatile profitability), the lender begins to take on the same risks as the owner. In reality, if the lender perceives the risks as high, the loan is not made at any rate because the lender does not want to take the same risks as the owner even with premiums.

In agriculture, the commodity risks tend to dictate that financial leverage needs to be low to keep the risks to the lender satisfactory without causing the lender to require a premium. However, if the producer implements proper risk management measures, the risks to the lender are reduced and the lender can allow higher leverage. Proper risk management measures stabilize profitability. When this is done properly, the risks taken by the lender due to the higher leverage are more than offset by the risk management measures implemented by the producer. Therefore, the lender allows higher leverage without requiring a premium. The higher leverage then can result in a higher ROE.

The DuPont model provides a tool to understand the risk - reward trade-off, as well as a tool to measure the value in stabilizing profitability that can result in a more effective use of leverage.

- Higher leverage (more debt) causes more risk to be assumed by the lender. Risk management measures utilized by the borrower can reduce some of this risk.
- The more risk assumed by the lender the more reward (higher interest rates) is expected by the lender as incentive to make the investment (loan).

## MANAGERIAL ACCOUNTING

Managerial (cost) accounting can help us determine:

- cost of production
- incremental or marginal costs
- analysis of breakeven points
- cost-volume-profit relationships
- asset utilization by cost or profit center

Production costs are usually classified as **fixed or variable**. Fixed costs do not change with the level of output and typically include depreciation, taxes, insurance, and interest. Variable costs change with output and include feed, propane, veterinary and health expenses. As the planning horizon lengthens, more costs become variable such that in the long run, all costs are variable.

Only variable costs should be considered in deciding how much to produce in the short run. A production function expresses the relationship between use of inputs and products produced. It will show the **marginal productivity** as inputs are increased. The optimum production level is where marginal cost equals the marginal value of product (where margin over variable costs (MOVC) = \$0).

### Profit Center vs. Cost Center

**Profit centers** are the profit making activities within the business; eg. pork.

- Measuring profit
  - Production profit = revenue from sale of pigs minus production costs but excluding general administration (G&A) and financing costs.
  - Operating profit = production profit – G&A
  - Net income = Operating profit – financing costs
- Breakevens
  - Production breakeven = production cost for the profit center, excluding G&A and financing.
  - Operating breakeven = production cost + G & A
  - Total breakeven = production cost + G&A + financing costs

**Cost centers** support activities important to and used by the profit center; i.e. transportation, feed mill, sow site. These should not be set up as separate accounts unless enough dollars are involved that warrant the time and effort to improve performance, and a person is assigned for managing and controlling costs and activities of the cost center.

## **Budgeting & Cost Control**

- This was well described recently by Dr. Gary Dial at the 2003 Leman Swine Conference. To summarize, cost management occurs at 2 levels. First, one must control the purchase price of inputs. This includes facility costs, feed, manure management, gilt replacements and semen, supplies, labor and utilities. The second level is the use of these inputs at farm level. Dr. Dial describes a 6-step approach to controlling use:
  - Set performance budgets that accurately project throughput,
  - Establish unit-use budgets to predict line-item costs for all inputs for the income statement,
  - Identify cost variances (differences in budgeted vs. actual) as they occur,
  - Use compliance reports to identify input wastage,
  - Link production and line-item variances to identify financial opportunities,
  - Empower farm staff to drive out costs.

To quote Dr. Dial, *“for cost management to be effective, a ‘low-cost culture’ must be created. This usually requires that biological endpoints, at least initially, be de-emphasized at the expense of financial endpoints.”* What is your break-even cost? Or, what is your cost / weaned pig? And just as important, where are your opportunities for decreasing this cost?

## **Evaluating Inventory**

- Inventory can be valued as “cost” or “value”. NPB recommends using cost of production as value (NPB spreadsheet available to help calculate the value). Costs associated with inventory should be carried on the balance sheet as pig inventory asset.
- Home raised corn inventory can be valued at market price. After transfer to production, it should be valued at cost.

## **Depreciation**

- Breeding stock should be depreciated over the estimated life of the animal; 2-2.5 years for sows and 2 years for boars at straight line. Salvage value is cull value. First-in, first-out cost flow.
- Buildings are 15 year at declining balance (150%) until straight line is greater. Salvage value for shell and concrete if at all.
- Equipment over useful life with declining balance method. Salvage value is scrap value.

## **MAKING DECISIONS WITH PARTIAL BUDGETS**

Some decisions are major with an impact for many years and involving major investment and often capital expenditures. For example, should we construct a gilt development barn? Or, should we sell the pigs at weaning on contract or construct facilities to market them ourselves? On the other hand, many decisions are relatively narrow in impact and short term in nature. For example, should we hire another person for farrowing? Or, should we

vaccinate for influenza? A partial budget is an economic analytic method for simple decisions where the time period is relatively short term and the outcome does not have a high degree of uncertainty. Partial budgets are relatively simple because they are restricted to estimating the change or **incremental** effect of the decision.

Every partial budget uses the same basic equation:

increased revenues associated with the decision  
+ decreased costs  
- increased costs  
- decreased revenues  
= change in revenue

**Sensitivity analysis** is a tool that allows us to assess the impact of the model's assumptions on the outcome. In a sensitivity analysis, we change one parameter (such as price) over a possible range of values while holding the rest of the variables in the analysis constant. In so doing, we explore the robustness of a partial budget outcome--i.e. how sensitive are the results of partial budgets to the assumptions in the analysis?

## TIME VALUE OF MONEY

For the major decisions where the impact is over a number of years, a more complex analytic method is required. This may involve understanding the time value of money. In simple terms, a dollar is worth more today than tomorrow and therefore the time value of money needs to be taken into account. This is increasingly true as inflation increases. Time value of money has 3 principles:

1. You can invest it today and earn interest and have more tomorrow.
2. Purchasing power of tomorrow's dollar is worth less due to inflation.
3. Money expected in the future is not a sure thing.

PV = present value of the amount today.

FV = future value of the amount at some point in the future.

i = interest rate, expressed as % / year; referred to as discount rate when calculating present value.

n = number of years that we are accounting for

pmt = payment made periodically (e.g. annual)

Suppose we can earn 10% on \$1.00. One year from now, I should have:

$$\begin{aligned} & \$1 + \$1 \times .10 \\ & = \$1 \times (1+.10) \\ & = \$1.10 \end{aligned}$$

Two years from now, I will have initial investment plus interest plus interest on the interest. This is called compounding which is the process of going from *PV* to *FV*. The future value of \$1 earning interest at rate *i* per period for *n* periods is  $(1+i)^n$ .

$$\begin{aligned} & \$1.00 + \$1.00 \times .10 + \$1.00 \times .10 \\ & = \$1.00 \times (1+.10)^2 \end{aligned}$$

The interest earned on the original principal is called **simple interest**. Interest earned on interest already paid is called **compound interest**. Total interest earned is the sum of the simple and compound interest. Frequency of compounding has a cumulative effect on the earned interest.

The generic formula is:

$$FV = PV (1+i)^n$$

or

$$PV = FV / (1+i)^n$$

**Rule of 72** – the number of years it takes to double an investment is equal to the number 72 divided by the interest rate in %/year.

**Multiple cash flows** - One can make financial decisions by comparing the present values of streams of expected future cash flows resulting from alternative courses of action. Multiple cash flows is when there are more than one cash inflow in the future. Use a **timeline** to analyze the value. Start with negative number to denote the initial investment. Present value of the stream of cash flows equals the sum of each year's PV. The resulting cumulative PV is also the NPV.

Year	1	2	3	4
Cash inflow	-1000	400	400	400

**Annuity** is a stream of cash flows with the same payment every year. Need to specify whether the payment is at beginning of each period such as with a savings plan (immediate annuity) or at the end of period such as a mortgage (ordinary annuity).

A **perpetuity** is a stream of cash flows that continue forever. The  $PV = (\text{payment} / i)$ .

**Amortization** is the process of paying off a loan's principal over the term of the loan. The amortization schedule will list the principal and interest payments.

Inflation favors debtors. If an interest rate on a savings plan is 3% and inflation is 3%, the purchasing power of my dollar does not increase. To account for this, we refer to **real and nominal interest rates**, with nominal interest rate being adjusted for inflation to give the real interest rate. When discounting a stream of cash flows, use nominal rate for nominal dollars and real rate for real dollars.

$$\text{Real interest rate} = (\text{Nominal interest rate} - \text{rate of inflation}) / (1 + \text{Rate of inflation})$$

## CAPITAL BUDGETING

This is the technique of assessing the profitability of specific investments, usually capital expenditures. The unit of analysis in capital budgeting is the investment project. From a finance perspective, investment projects are best thought of as consisting of a series of

contingent cash flows over time, whose amount and timing are partially under the control of management. Most investment projects requiring capital expenditures fall into three categories: new products, cost reduction, and replacement. Ideas for investment projects can come from customers and competitors, or from within the firm's own R&D or production departments.

The objective of capital budgeting procedures is to assure that only projects which increase **shareholder value** (or at least do not reduce it) are undertaken. This capital budgeting process involves coming up with ideas for investment projects, evaluating the proposals and deciding which to accept. The benefits incur over time and therefore, the analysis can be thought of as a partial budget over time.

**Effective decision making entails:**

- having accurate financial data
- determining the incremental effect of the decision over time
- determining whether the expected return exceeds alternative investments
- considering the risk of decision (sensitivity analysis)

**Most financial analyses:**

- do a partial budget for only 1 period of time (eg. 1 yr) and state a benefit : cost,
- examine benefit over time but don't adjust values to present value,
- do not consider tax advantages of borrowing, and/or
- have no sensitivity analysis.

**Concepts in the Discounted Cash Flow (DCF) decision model:**

Projects may be evaluated using a discounted cash flow procedure wherein the incremental cash flows associated with the project are estimated and their NPV is calculated using a risk-adjusted discount rate, which should reflect the risk of the project.

**Incremental change in income**

- After-Tax Operating Cash Flow (ATOCF)
- Discounted to Present Value
- Use of Other Peoples' Money (i.e. debt),
- Residual value (perpetuity, liquidation or salvage)
- Cumulative Present Value (NPV) & Internal Rate of Return (IRR), Payback and Discounted payback,
- Sensitivity analysis of key drivers

**Incremental change in income**

- it is essential to isolate the incremental effect of the investment decision (with vs. without the investment)
- an annual partial budget is extremely useful to do this:  
= (additional income + reduced expenses) - (reduced income + increased expenses)
- does not include sunk costs

### **After-tax operating cash flow (ATOCF)**

Cash flow from operations = Sales

- Operating expenses including operating int. + taxes
- + Depreciation (non cash expense)
- Change in working capital
- Other capital expenditures required to conduct the project,

### **Why separate operating from finance?**

- Need to capture the performance and profitability of the business (operations), independent of how it is financed (use IRR)
- The effect of financing decisions is captured in the cost of capital (use cumulative present value)

### **Why after tax?**

- Cost of capital is calculated after tax (incorporating tax shield for interest).
- Implications to the investors are after tax.

### **Annual after-tax cash flow is composed of:**

- Return on invested capital
- Recovery of invested capital
- “Excess return” is the return beyond the return and recovery of invested capital (referred to as “Economic Value Added” (EVA)).

### **Residual value**

- Perpetuity method assumes that after the forecast period, the investment will earn on average, the cost of capital, forever.

$$\text{Residual value} = \frac{\text{Perpetuity cash flow}}{\text{Cost of capital}}$$

- Alternatively, if a herd is planning to exit the business, residual value could be the liquidation value (book, market or salvage value).
- Most conservative is to assume no or even a negative residual value.

### **Discounting**

- is finding the present value of some future amount. The present value of \$1 discounted at rate  $i$  per period for  $n$  periods is  $1/(1+i)^n$ .
- Discount rate is the rate used to calculate the present value of future cash flows
- Rate of inflation is commonly used but this is inadequate for investment decisions.
  - We often use the opportunity cost of capital as the discount rate.
  - Risk-Adjusted Discount Rate (RADR) = discount rate adjusted for business and financial risk (weighted average cost of capital or WACC).
  - If the project happens to be a “mini-replica” of the assets currently held by the farm, then management should use the farm's cost of capital in computing the project's net present value. However, sometimes it may be necessary to use a discount rate, which is totally unrelated to the cost of capital of the firm's current operations. The correct cost of capital is the one applicable to farms in the same industry as the new project.

## **Measures of return**

### **1. Net Present Value (NPV)**

- NPV is the difference between the present value of all future cash inflows minus the present value of the investments. Often a project is accepted if the NPV is positive and rejected otherwise.

### **2. Internal Rate of Return (IRR)**

- A second method for evaluating capital expenditure proposals. Discount rate at which the net present value (NPV) of the investment is zero i.e. discount rate that makes the PV of the future cash inflows equal to the initial outlay.

### **3. Payback**

- Payback period is the time since investment is made that it takes for investment amount to be regained in nominal dollars
- Discounted cash flow payback period is the time it takes for the investment to be regained PLUS implicit interest computed at the project's cost of capital.

## **Sensitivity analysis of key drivers**

- We rarely know exact anticipated costs and benefits.
- Key drivers are those components of incremental income that have most influence on the projected profit:
  - feed efficiency
  - premium / pig
  - market price
  - the projected investment amount

## **CONCLUSIONS**

Having production records, without financial, is a recipe for failure. Our nature is to tend to improve whatever we are focused on. Therefore, it is imperative that we focus on the right measures. Managing costs, optimizing productivity, maintaining inventories, and effective marketing will lead to profitability. This requires us to have good financial records to complement our production records.