

Class 3: What is the Value of An Asset?

Gilligan's Island:

The Concept Behind NPV

The story so far:

In the last class, we talked about a number of issues. We talked about the career opportunities available to people specializing in finance, we discussed ways in which finance might be expected to change in the 1990's, we explored different ways firms could be organized, and lastly we started discussing the role of a firm. Why might firms exist and in whose interests might they be run? The brief answer we gave last time was that managers should focus on maximizing shareholder's wealth. To do this they should maximize the Net Present Value (NPV). In this class, we will focus on NPV - what it is and why it is so important.

Now read on ...

Why Should Managers Maximize Shareholder Value?

Managers of firms can have several different objectives - they can

- ★ Maximize shareholder wealth
- ★ Maximize stakeholder wealth - a concept often talked about in Europe
- ★ Maximize their own wealth - agency problems

We discussed some of these issues in the last class but briefly, we came up with five reasons why managers might want to focus on shareholder value:

- ★ Market for corporate control (hostile takeover bid)
- ★ Management compensation tied to share price and profits
- ★ Increased global competition will make alternative goals (e.g. maximize “stakeholder” value) less viable.
- ★ Competitive managerial labor market
- ★ A useful benchmark to measure the opportunity costs of alternative objectives

The Intuition Behind Net Present Value

There are two major types of decisions we will concentrate on finance.

- ★ The financing decision of the firm (how should a firm obtain cash for financing its activities)
- ★ The investment decision of the firm (how should a firm invest the cash it has raised).

Both kinds of decisions involve cash inflows and outflows at different periods of time. A good decision requires that the value of the inflows is larger than the value of the outflows - even though the inflows and outflows may be occurring at different points in time. Therefore, we need a set of techniques that allows us to measure the value consequences of a specific decision. The valuation technique is called : **Discounted Cash Flow Method**. The total value of all the inflows and outflows of cash obtained using the discounted cash flows is called the **Net Present Value** and our rule for a manager is simple - take a project if its NPV is positive, reject it if the NPV is negative. Unfortunately, discounting cash flows is not easy (otherwise everyone would be a finance professor and we wouldn't be paid so much!) There are several issues connected with discounting cash flows and this course will focus on these issues.

Issues Connected with Discounting Cash Flows

- ★ Which cash-flows do we discount?
- ★ How do we get the discount rate? (the weighted average cost of capital)
 - in a riskless world
 - in a risky world
 - Portfolio theory
 - Capital Asset Pricing Model
 - Modigliani-Miller approaches to adjusting the cost of capital when debt is present
 - the Weighted Average Cost of Capital (WACC)
- ★ Apply the Discounted Cash Flow valuation model to
 - Valuation of projects
 - Valuation of companies
 - Valuation of bonds
 - Valuation of stocks

We have so far come up with many reasons why a manager might want to maximize shareholder wealth - but which shareholder?

There may be some retired pensioners who want the firm to invest in short-term assets, because they will not be around for very long to see any long-term rewards. On the other hand, yuppies just starting out on their careers might want the firm to invest in long-term projects that produce no profits now.

Another example is that of Japanese or German shareholders who are supposed to be much more focused on the long-term than American shareholders - who want results *now*. What should a poor manager do to reconcile all these differing demands?

Financial Markets and the Present Value Rule

A Simple Economy

There used to be a television serial called [Gilligan's Island](#) back in the 60's. Let's start by looking at the economy on Gilligan's Island.



When this episode begins, we find our ten castaways on Gilligan's island sick of eating coconuts.

Fortunately, they have also saved a sack of potatoes. They have to decide how many potatoes to eat (how many potatoes to plant?) .

Suppose we define :

P_0 = number of potatoes the castaways can eat now

P_1 = number of potatoes the castaways can eat after the potato harvest

A = maximum number of potatoes a castaway can eat now (all the potatoes in the sack divided by

10).

Then we can draw two graphs - the production frontier and the preference sets.

OPPORTUNITY SET

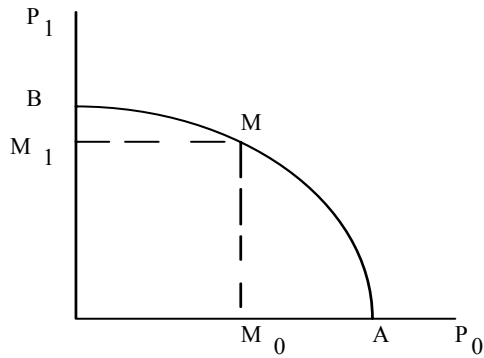


Figure 2.1 Production function

PREFERENCES

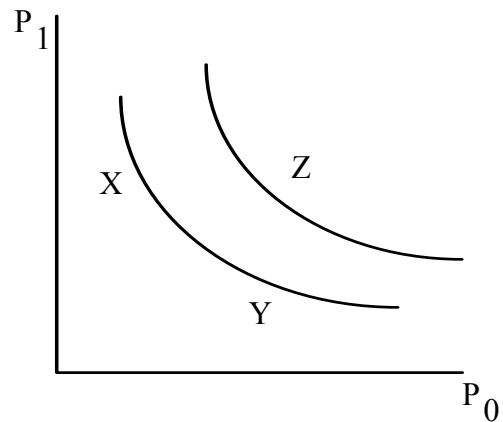


Figure 2.2 Preferences

As can be seen, the production function is not a straight line - this is an example of decreasing returns to scale - if you plant ten potatoes, you may get back 15 next period - if you plant 20, you would get only 25 not 30! (Decreasing returns to scale also hold in other fields such as studying for your exams - studying for 10 hours may get you 75%, studying for 20 certainly will not get you 150%!)

The preference function on the other hand, increases to the right. I am indifferent between X and Y but I would prefer Z to either X or Y.



Now, the Skipper, one of the castaways on the island is pretty old and frankly, does not look like he will last much longer. So he prefers to eat lots of potatoes today and decides to worry about the future when (and if) it comes. Putting both his preference curves and the production function on the same graph gives us

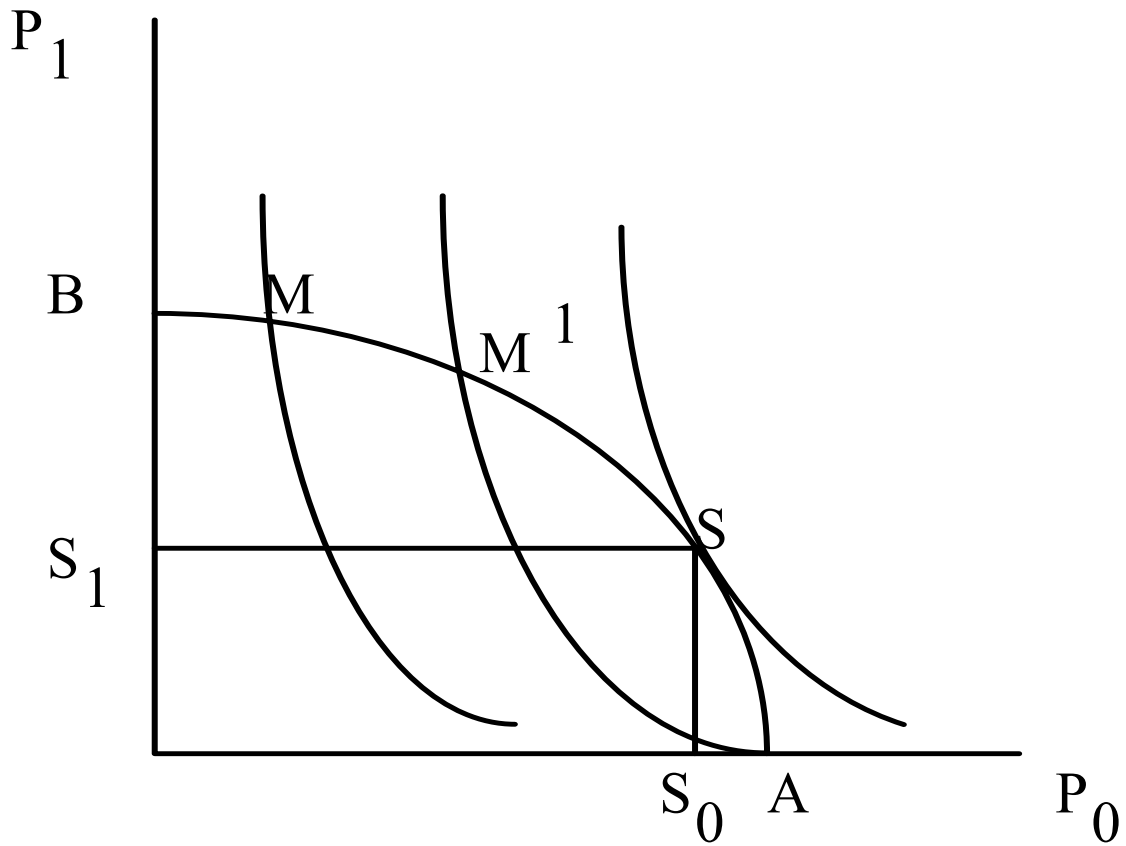


Figure 2.3 The skipper's optimal decision without capital markets



Ginger on the other hand is young and obviously takes a lot more exercise than Skipper. She prefers to consume less today and more tomorrow. Her optimal decision looks like

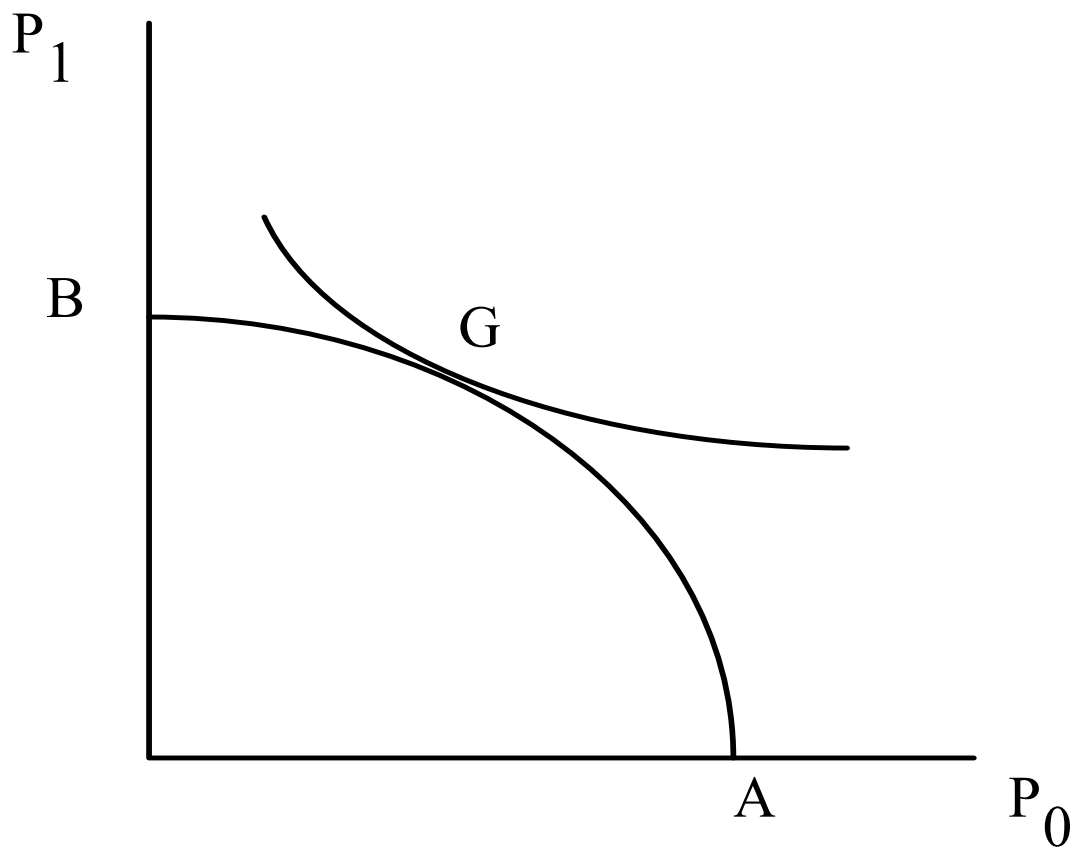


Figure 2.4 Ginger's optimal decision without capital markets

So if Skipper and Ginger were to form a firm, they would never agree on the number of potatoes to plant - Ginger would want to plant more potatoes than Skipper. The situation changes dramatically when we introduce Mr Howell, a capitalist who introduces capital markets to the island.

Introduction of a Capital Market



Mr Howell (one of the castaways) decides to act as a market maker and sets up the GIPE (Gilligan's Island Potato Exchange).

He is willing to borrow and lend potatoes at interest rate r .

If he borrows 1 potato \Rightarrow he gives back $(1 + r)$ potatoes after the harvest.

If he lends 1 potato \Rightarrow he gets back $(1 + r)$ potatoes after the harvest.

This graph can briefly be represented as:

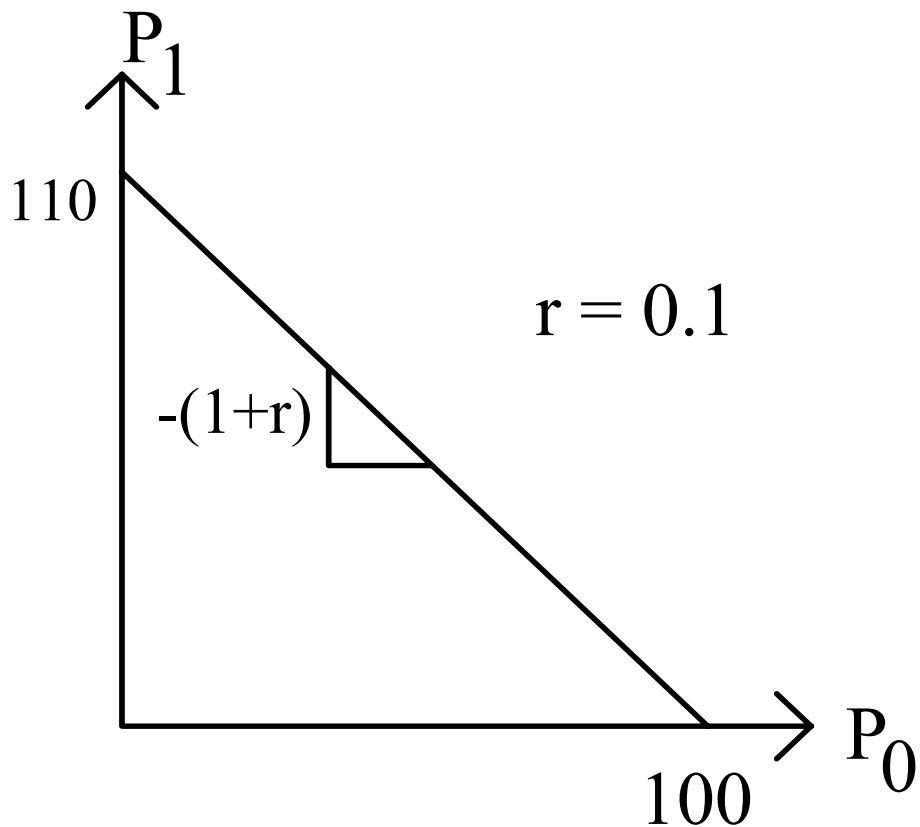


Fig 2.5 Capital market opportunities for a castaway who owns 100 potatoes.

Optimal Production Decisions With Capital Markets

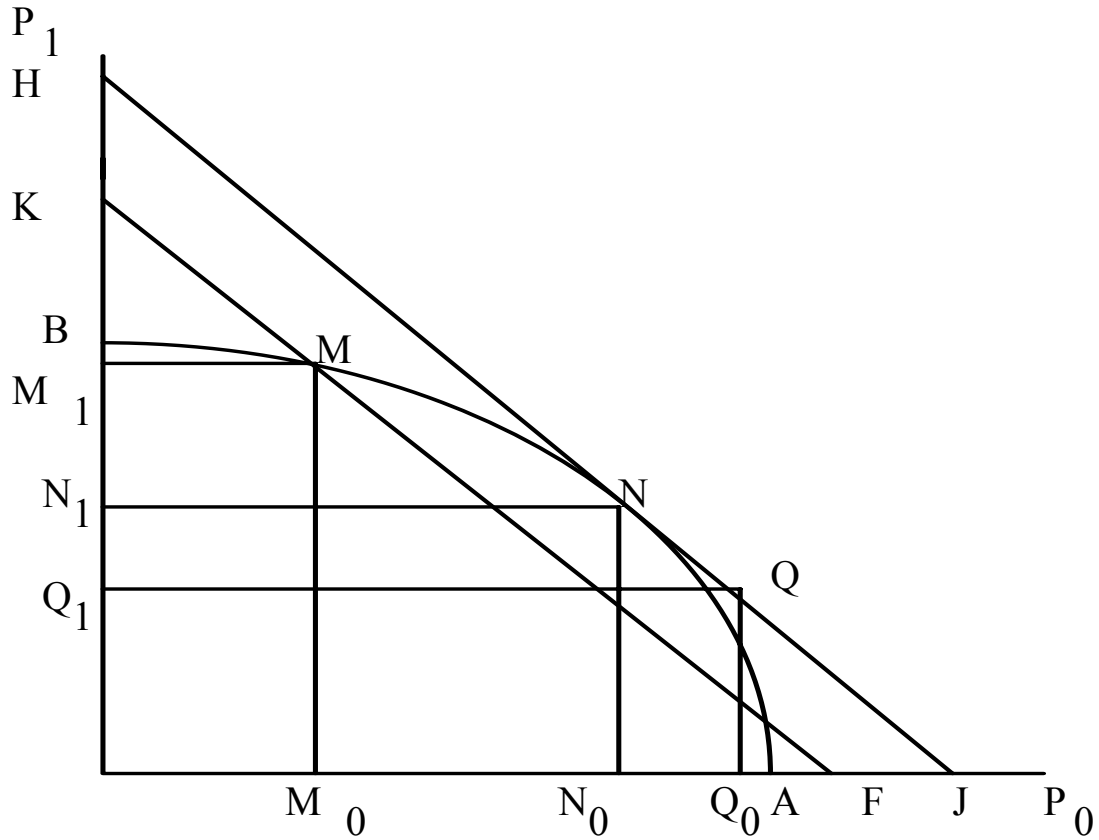


Fig 2.6 Feasible and optimal eating choices with capital markets

Optimal Consumption Decisions with Capital Markets

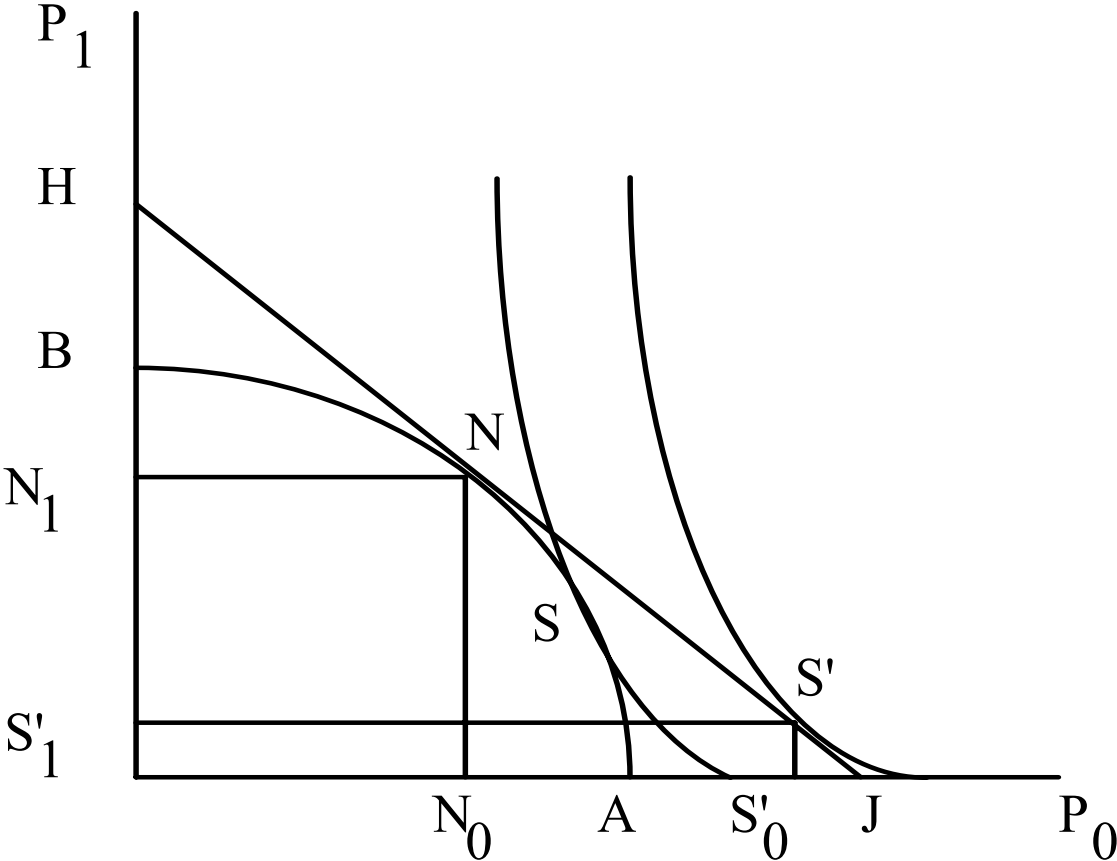


Figure 2.7 The Skipper’s optimal decision with capital markets

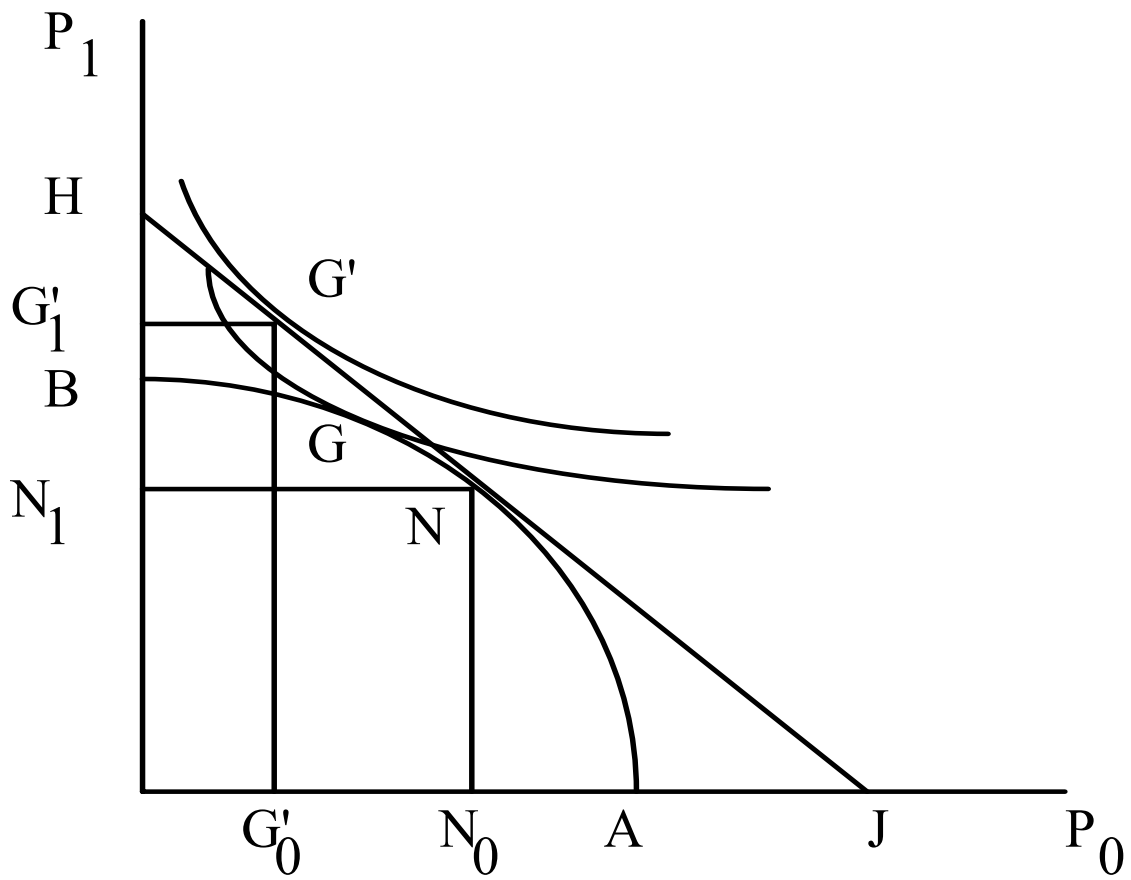


Figure 2.8 Ginger's optimal decision with capital markets

What Is This Optimal Point “N” ?

At N, the distance between the capital market line and point A is maximized = AJ

$$AJ = \frac{NN_0}{(1+r)} - N_0A$$

where NN_0 = number of potatoes harvested at point N and

N_0A = number of potatoes planted or “invested”

$$AJ = PV - I = NPV$$

where I = investment

PV = present value of output

NPV = net present value

An Industrialized Economy

As we bid farewell to our castaways, we may wonder what relevance our Gilligan's Island story has to the real world. The answer is simple : quite a lot. Just go back through our story and make the following name changes :

old name	new name
the castaways	the shareholders of a firm
potatoes	money
initial potatoes	initial dollar holdings in the firm
plant potatoes	the firm invests in a riskless one-period asset
the GIPE	the financial markets
eat potatoes	receive a dividend from the firm or money from the financial markets.

Basic Conclusions

1. Capital markets allow separation between investment and consumption decisions.
2. Optimal investment decision implies maximizing the net present value of the investment
3. In order to make decisions at the corporate level, you have to look at the capital market alternative.

As we can see however, calculating the NPV requires us to calculate first the cash flows in every period and second the discount rate. The first part of this course concentrates on calculating the cash flows for different types of stocks, bonds, companies and projects. But first let's do some exercises in compounding and discounting to make sure we can all put it together when we do compute the cash flows.