Understanding Net Present Value

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Who are we concerned with in finance?

- Firms
- Investors
- Financial intermediaries
- Governments

What do these players care about?

- Corporate managers:

What should firms spend their funds on?

Investment decisions

Where should they get their funds?

Financing decisions

- Investors:
  - Can I get a decent return on my investment – maximize returns with minimum risk?
  - Can I make sure that the company managers don't just steal my money and walk away?

- Financial intermediaries:
  - Can I bring suppliers of capital (investors) together with people who require capital (firms?)
  - Can I make money on the spread?

- Government:
  - Can I make sure people don't complain that the process is unfair?
  - Can I make sure that allowing firms or intermediaries to do something does not cause the whole system to blow up? (Externalities)

How can we address all these perspectives?

The six basic ideas of finance

1. NPV
2. Portfolio theory and the CAPM
3. Capital structure theory
4. Option pricing theory
5. Asymmetric information
6. Market efficiency

Markowitz and Sharpe (1990)

Modigliani (1985) and Miller (1990)

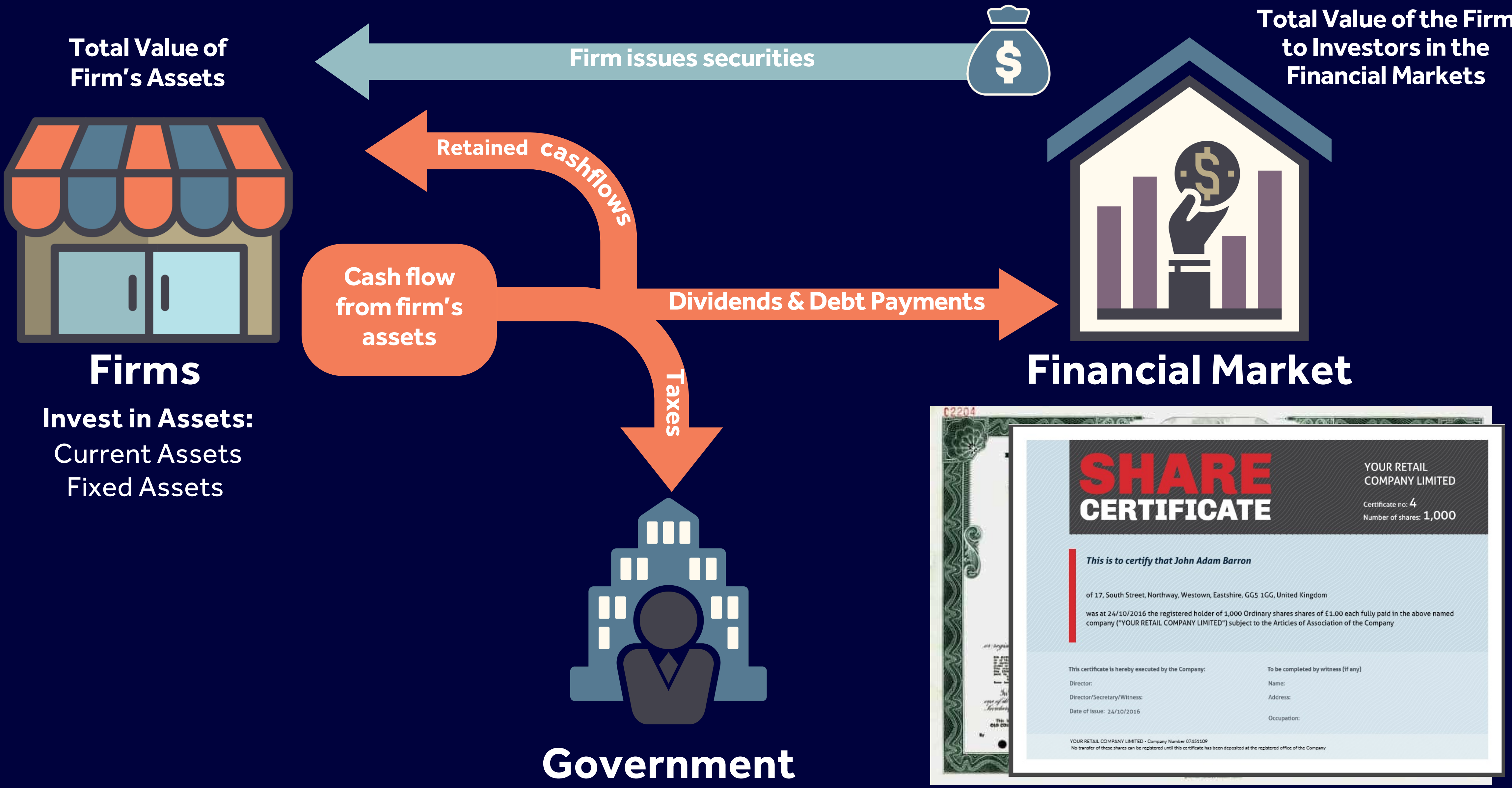
Scholes and Merton (1997)

Akerlof, Spence, and Stiglitz (2001)

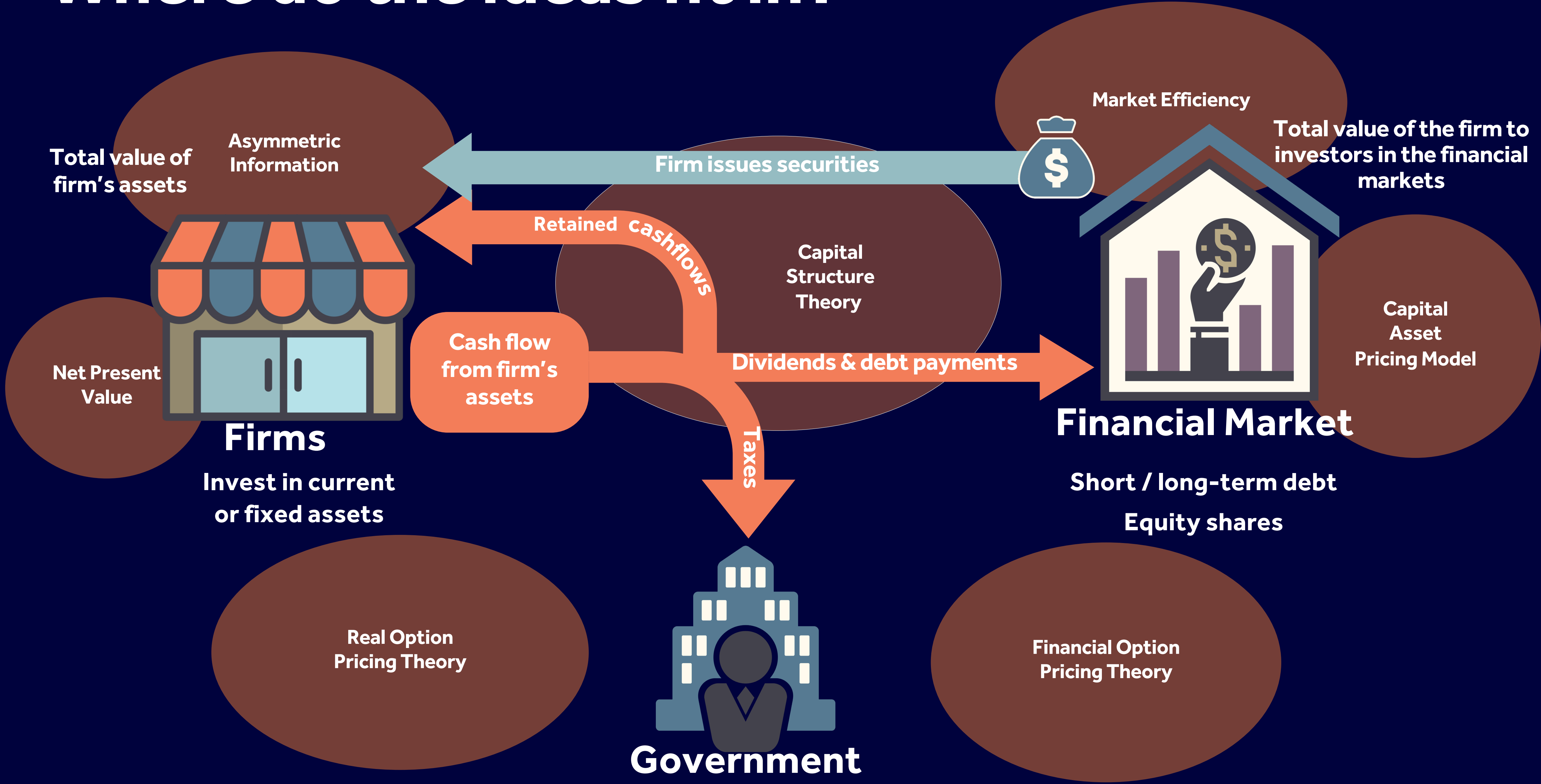
Kahneman (2002); Fama and Shiller (2013); Thaler (2017)

Where do these six basic ideas fit in?

Finance 101: The cycle of finance

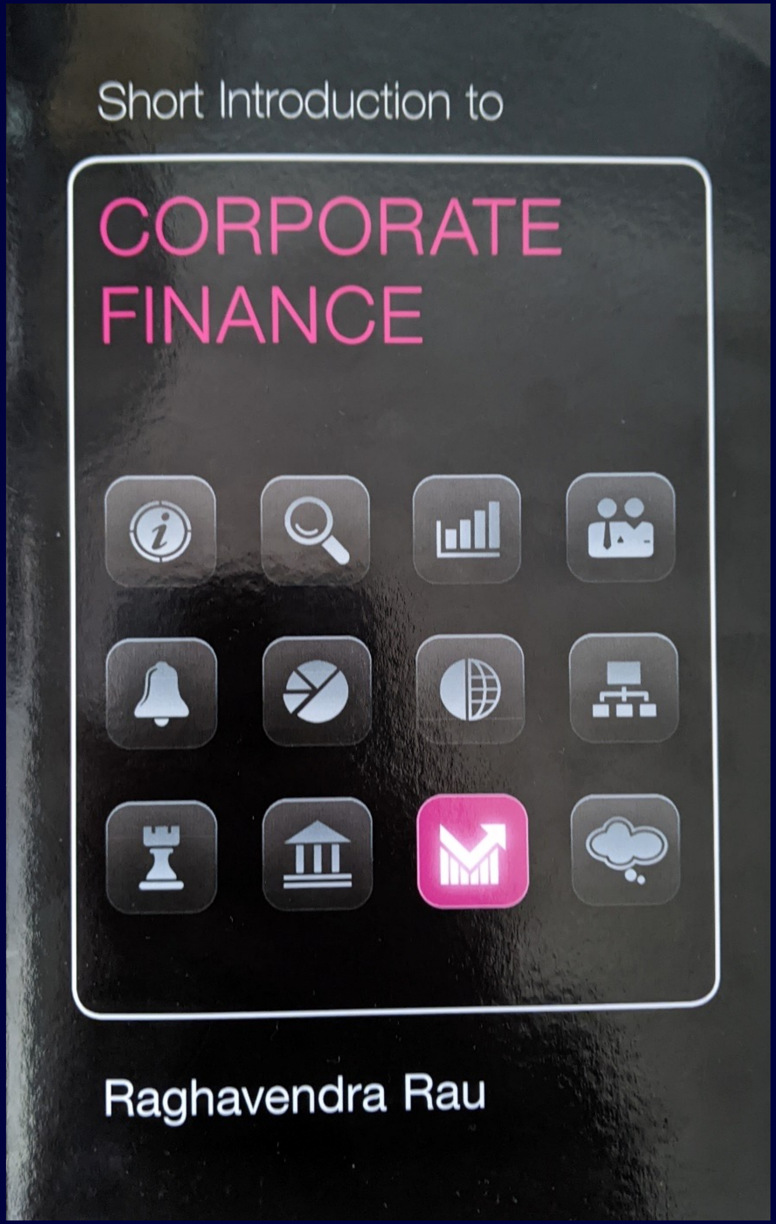


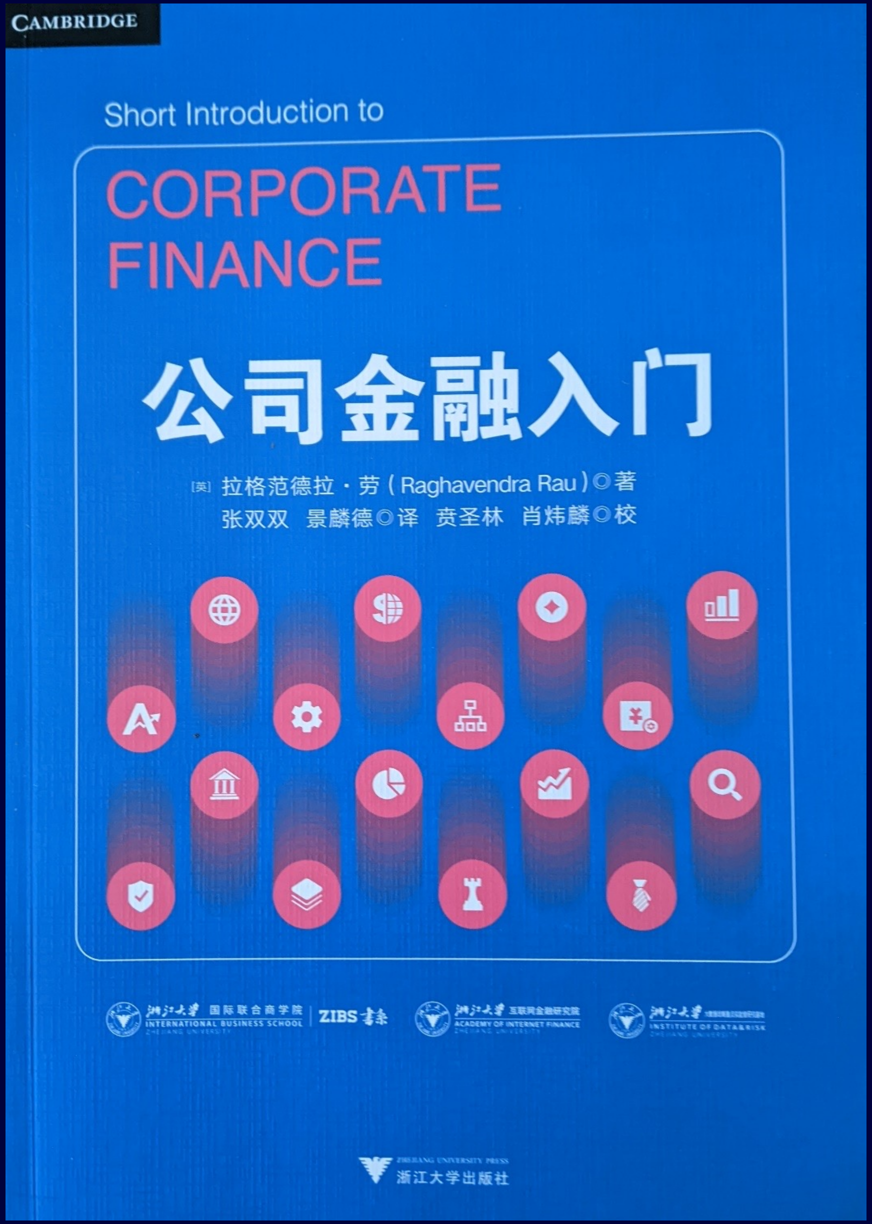
Where do the ideas fit in?



What is finance all about?

- Promises
- I will give you some (fantastically large) amount in the future if you give me some money today.
- What are these promises worth?


Short Introduction to
CORPORATE
FINANCE
Raghavendra Rau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Present and future values

- You deposit £100 into your bank account. The bank tells you that the interest rate is 10%. At the end of one year, how much is in your bank account?

How did you get that answer?

$$100 \times (1 + 10\%) = 110$$

What about if you left the money there for another year?

$$110 \times (1 + 10\%) = 121$$

- Suppose you want to know today how much you will have in two years?

$$100 \times (1 + 10\%) \times (1 + 10\%) = 121$$

$$100 \times (1 + 0.10)^2 = 121$$

- Or, more generally:

$$PV \times (1 + r)^t = FV$$

How do you handle a promise?

- Invert the formula

$PV \times (1 + r)^t = FV$ becomes $PV = \dfrac{FV}{(1 + r)^t}$

- In our example

$$100 = \frac{121}{(1 + 0.10)^2}$$

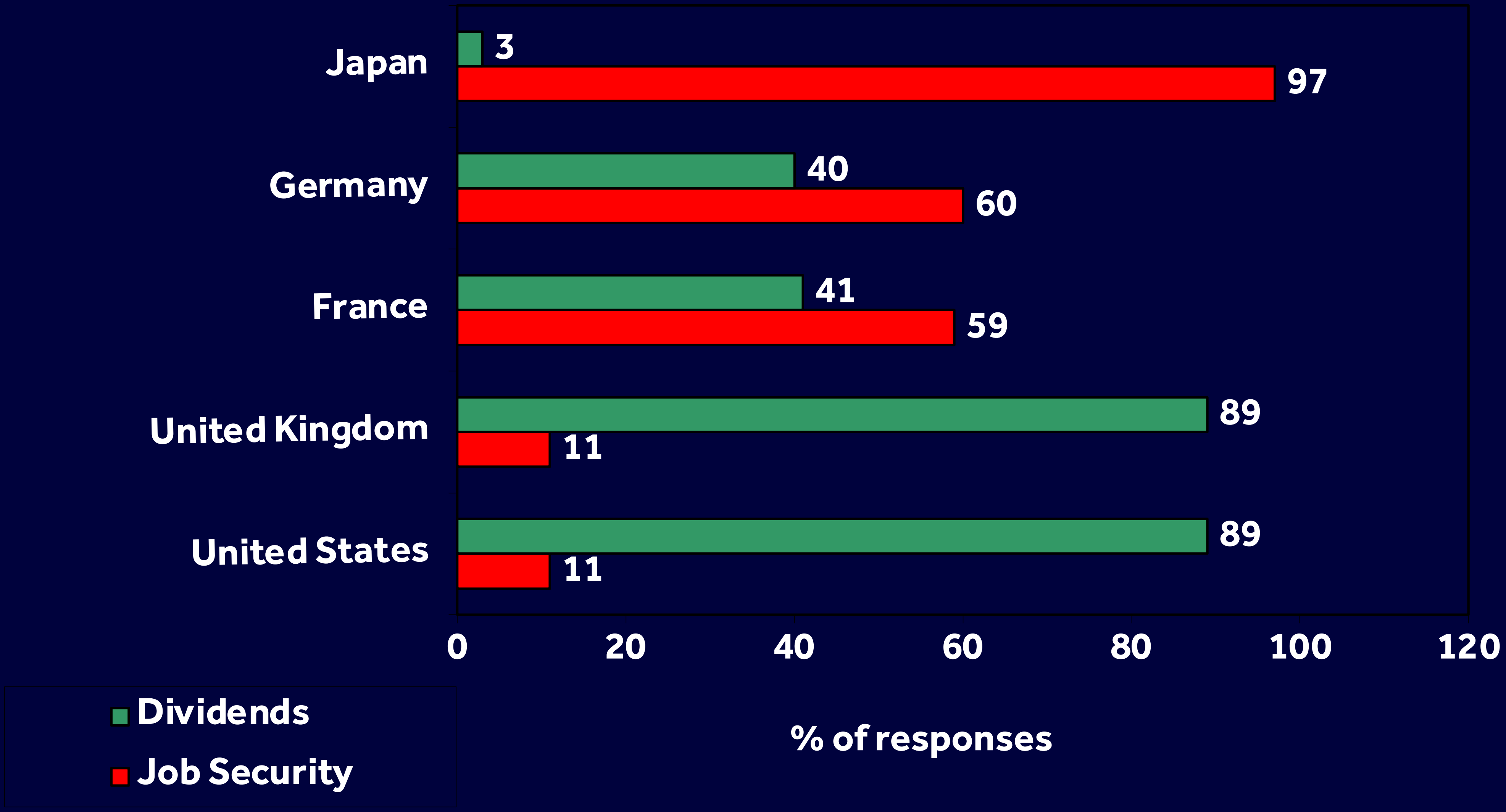
- This is the most important formula in finance

$$PV = \frac{FV}{(1 + r)^t}$$

In whose interest do you think a firm should be managed?

- Workers
- Creditors
- Suppliers
- Managers
- Customers
- Government
- Debt holders
- Shareholders
- All of the above

Which is more important? Jobs or paying dividends?



What do finance professors teach?

- Maximize th
- Maximize sh
- Maximize fi

A Friedman doctrine—

The Social Responsibility Of Business Is to Increase Its Profits

By MILTON FRIEDMAN

New York Times, September 13, 1970

TAMING G.M.—Chairman James Roche of General Motors (right) replies to members of Campaign G.M. (below, wearing "Tame G.M." buttons) at the corporation's stockholders' meeting in May. Representatives of the campaign demanded that G.M. name three new directors to represent "the public interest" and set up a committee to study the company's performance in such areas of public concern as safety and pollution. The stockholders defeated the proposals overwhelmingly, but management, apparently in response to the second demand, recently named five directors to a "public-policy committee." The author calls such drives for social responsibility in business "pure and unadulterated socialism," adding: "Businessmen who talk this way are unwitting puppets of the intellectual forces that have been undermining the basis of a free society."

Your mission

Your manager gives y … t it)

- Everyone in your t
- They never talk to … r
  computers and th … orld
- You are the only o
- Since everyone kn … ther into a
  happy team, you a … one can go
  to which will make
- Budget: Unlimited
- Caveat: Only one t
- How do you find o … vill make
  them happy?

In whose interest do you think a firm should be managed?

- Workers
- Creditors
- Suppliers
- Managers
- Customers
- Government
- Debt holders
- Shareholders
- All of the above

The principal-agent problem

WHEN I hear businessmen speak eloquently about the "social responsibilities of business in a free-enterprise system," I am reminded of the wonderful line about the Frenchman who discovered at the age of 70 that he had been speaking prose all his life. The businessmen believe that they are defending free enterprise when they declaim that business is not concerned "merely" with profit but also with promoting desirable "social" ends; that business has a "social conscience" and takes seriously its responsibilities for providing employment, eliminating discrimination, avoiding pollution and whatever else may be the catchwords of the contemporary crop of reformers. In fact they are—or would be if they or anyone else took them seriously—preaching pure and unadulterated socialism. Businessmen who talk this way are unwitting puppets of the intellectual forces that have been undermining the basis of a free society these past decades.

The discussions of the "social responsibilities of business" are notable for their analytical looseness and lack of rigor. What does it mean to say that "business" has responsibilities? Only people can have responsibilities. A corporation is an artificial person and in this sense may have artificial responsibilities, but "business" as a whole cannot be said to have responsibilities, even in this vague sense. The first step toward clarity in examining the doctrine of the social responsibility of business is to ask precisely what it implies for whom.

Presumably, the individuals who are to be responsible are businessmen, which means individual proprietors or corporate executives. Most of the discussion of social responsibility is directed at corporations, so in what follows I shall mostly neglect the individual proprietor and speak of corporate executives.

IN a free-enterprise, private-property system, a corporate executive is an employe of the owners of the business. He has direct responsibility to his employers. That responsibility is to conduct the business in accordance with their desires, which generally will be to make as much money as possible while conforming to the basic rules of the society, both those embodied in law and those embodied in ethical custom. Of course, in some cases his employers may have a different objective. A group of persons might establish a corporation for an eleemosynary purpose—for example, a hospital or a school. The manager of such a corporation will not have money profit as his objective but the rendering of certain services.

In either case, the key point is that, in his capacity as a corporate executive, the manager is the agent of the individuals who own the corporation or establish the eleemosynary institution, and his primary responsibility is to them.

Needless to say, this does not mean that it is easy to judge how well he is performing his task. But at least the criterion of performance is straightforward, and the persons among whom a voluntary contractual arrangement exists are clearly defined.

Of course, the corporate executive is also a person in his own right. As a person, he may have many other responsibilities that he recognizes or assumes voluntarily—to his family, his conscience, his feelings of charity, his church, his clubs, his city, his country. He may feel impelled by these responsibilities to devote part of his income to causes he regards as worthy, to refuse to work for particular corporations, even to leave his job, for example, to join his country's armed forces. If we wish, we may refer to some of these responsibilities as "social responsibilities." But in these respects he is acting as a principal, not an agent; he is spending his own money or time or energy, not the money of his employers or the time or energy he has contracted to devote to their purposes. If these are "social responsibilities," they are the social responsibilities of individuals, not of business.

What does it mean to say that the corporate executive has a "social responsibility" in his capacity as businessman? If this statement is not pure rhetoric, it must mean that he is to act in some way that is not in the interest of his employers. For example, that he is to refrain from increasing the price of the product in order to contribute to the social objective of preventing inflation, even though a price increase would be in the best interests of the corporation. Or that he is to make expenditures on reducing pollution beyond the amount that is in the best interests of the corporation or that is required by law in order to contribute to the social objective of improving the environment. Or that, at the expense of corporate profits, he is to hire "hard-core" unemployed instead of better-qualified available workmen to contribute to the social objective of reducing poverty.

In each of these cases, the corporate executive would be spending someone else's money for a general social interest. Insofar as his actions in accord with his "social responsibility" reduce returns to stockholders, he is spending their money. Insofar as his actions raise the price to customers, he is spending the customers' money. Insofar as his actions lower the wages of some employes, he is spending their money.

The stockholders or the customers or the employes could separately spend their own money on the particular action if they wished to do so. The executive is exercising a distinct "social responsibility," rather than serving as an agent of the stockholders or the customers or the employes, only if he spends the money in a different way than they would have spent it.

But if he does this, he is in effect imposing taxes, on the one hand,

(Continued on Page 122)

Example

As the CEO of a large multinational, you are weighing the purchase of a

rk (to Wall Street),

Agency costs between shareholders and bondholders

Example 1: Borrowing from the Mafia

You borrow £10,000 from your friendly neighborhood Mafia don. The due date is tomorrow. Unfortunately, you have only £500 left.

The don will have your leg broken if you do not return with the £10000 tomorrow.

What do you do?

Example 2: FedEx

Bigger problem? Which shareholder?

- Some short-term shareholders may want profits now
- Other long-term shareholders may want profits far into the future.

Introducing the island problem

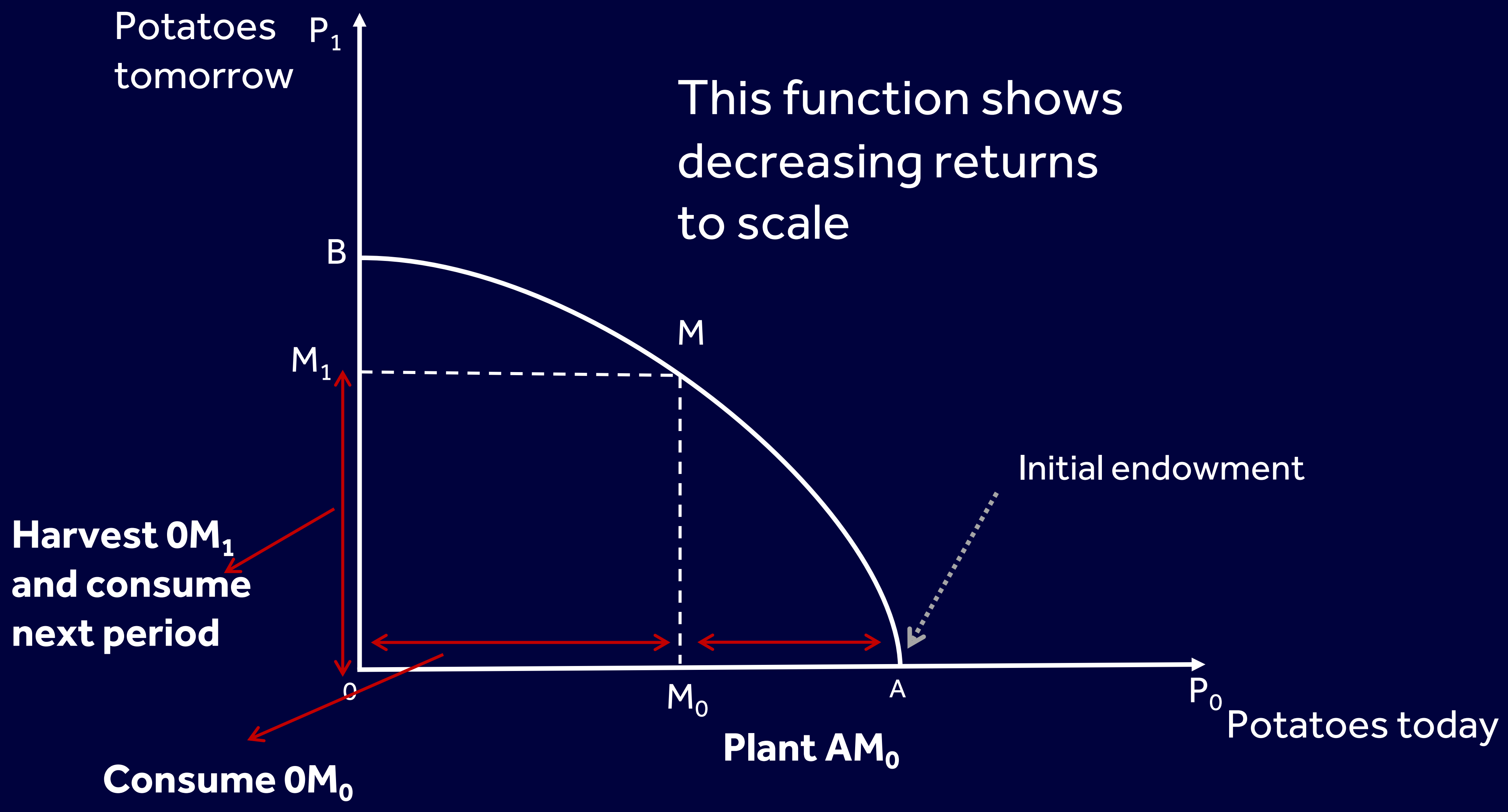
Shareholders:

Skipper: Wants to consume everything today; nothing tomorrow

Ginger: Wants to leave something for tomorrow; wants to consume less today

But what can they eat on the island?

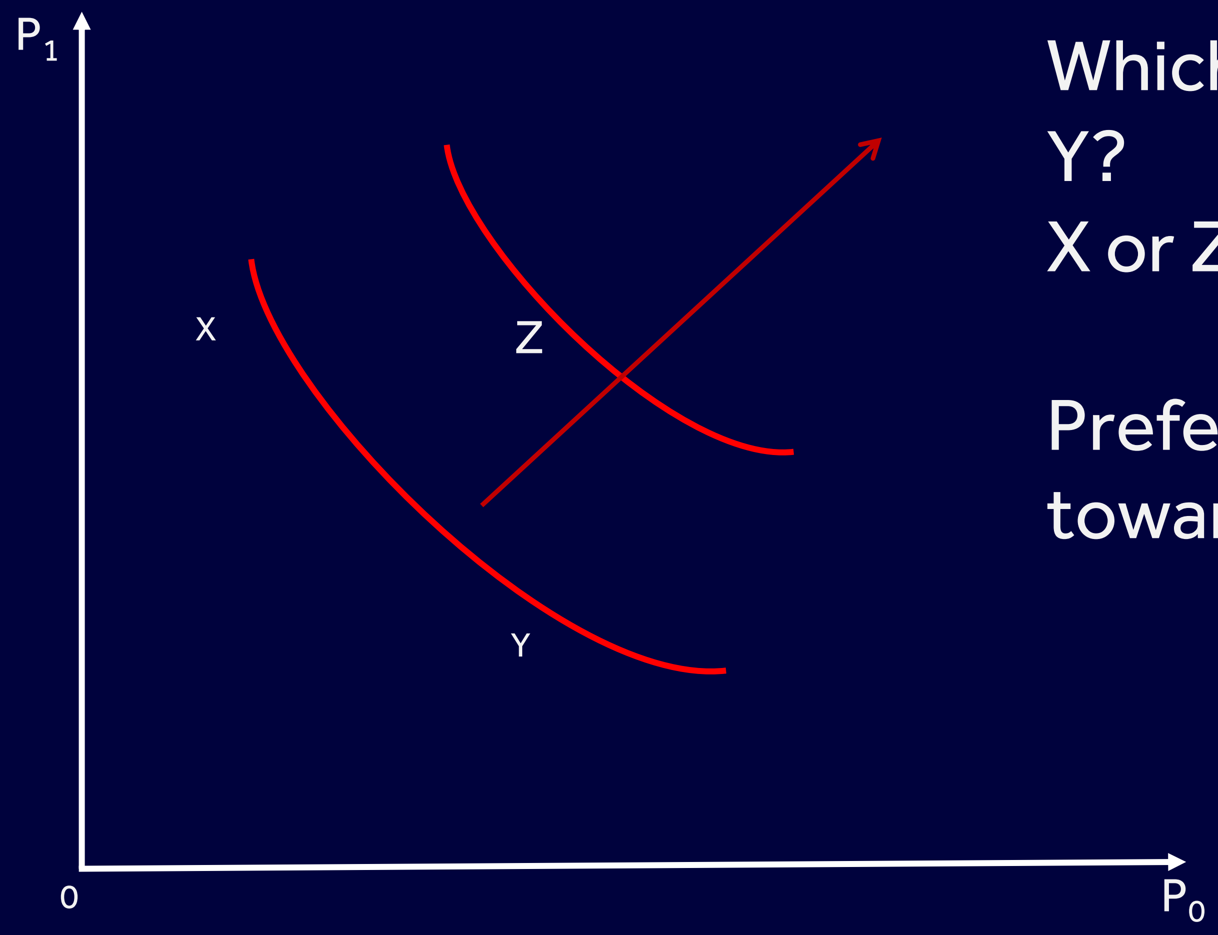
Production function for potatoes



Mapping preferences

- Economists usually model this as a choice between cake and ice cream.
- If you have one slice of cake and two scoops of ice cream, how much ice cream would you be willing to give up to get one more slice of cake?
- How much cake would you be willing to give up to get one more scoop of ice cream?

Mapping preferences

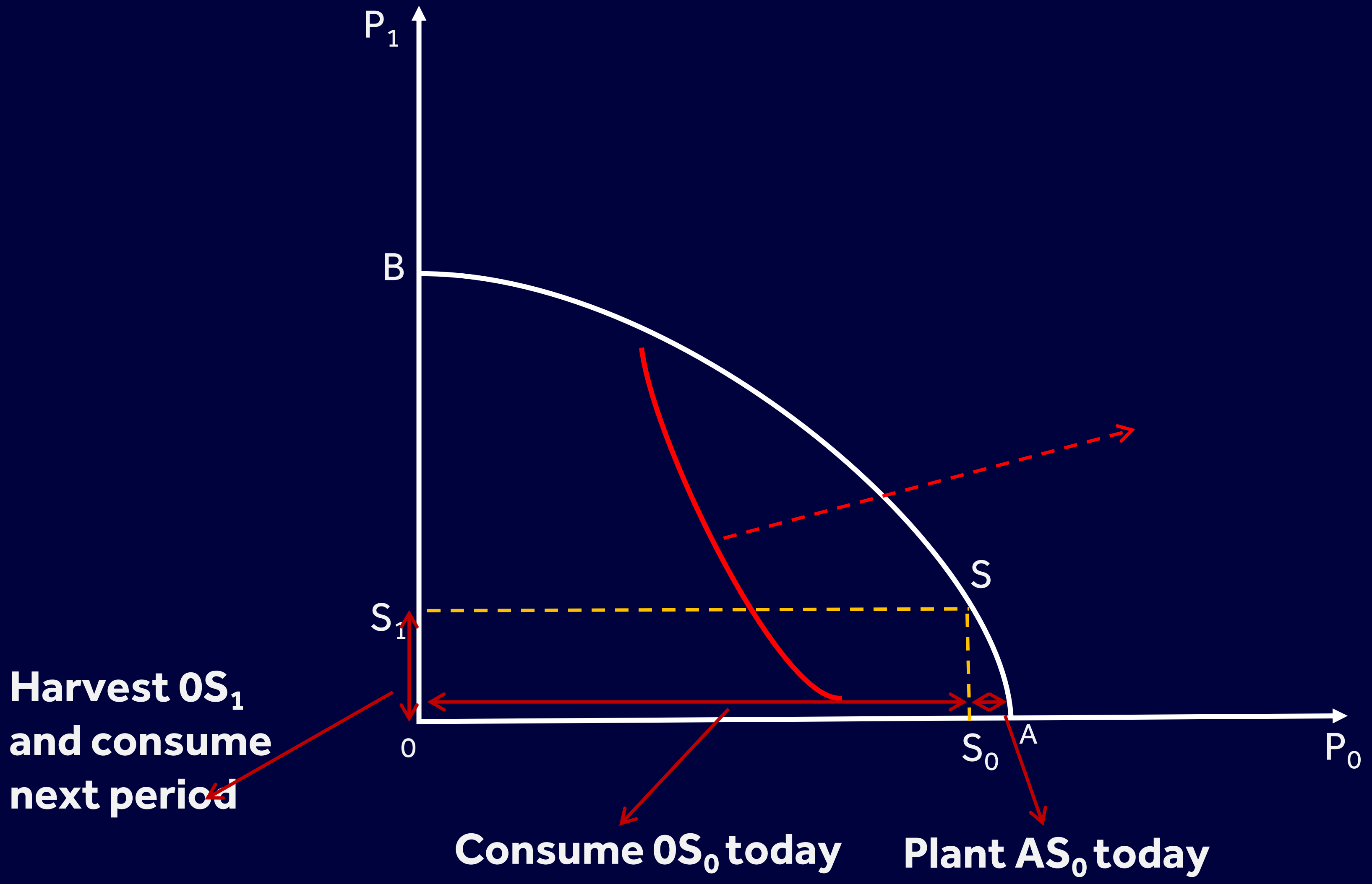


Which do I prefer? X or Y?

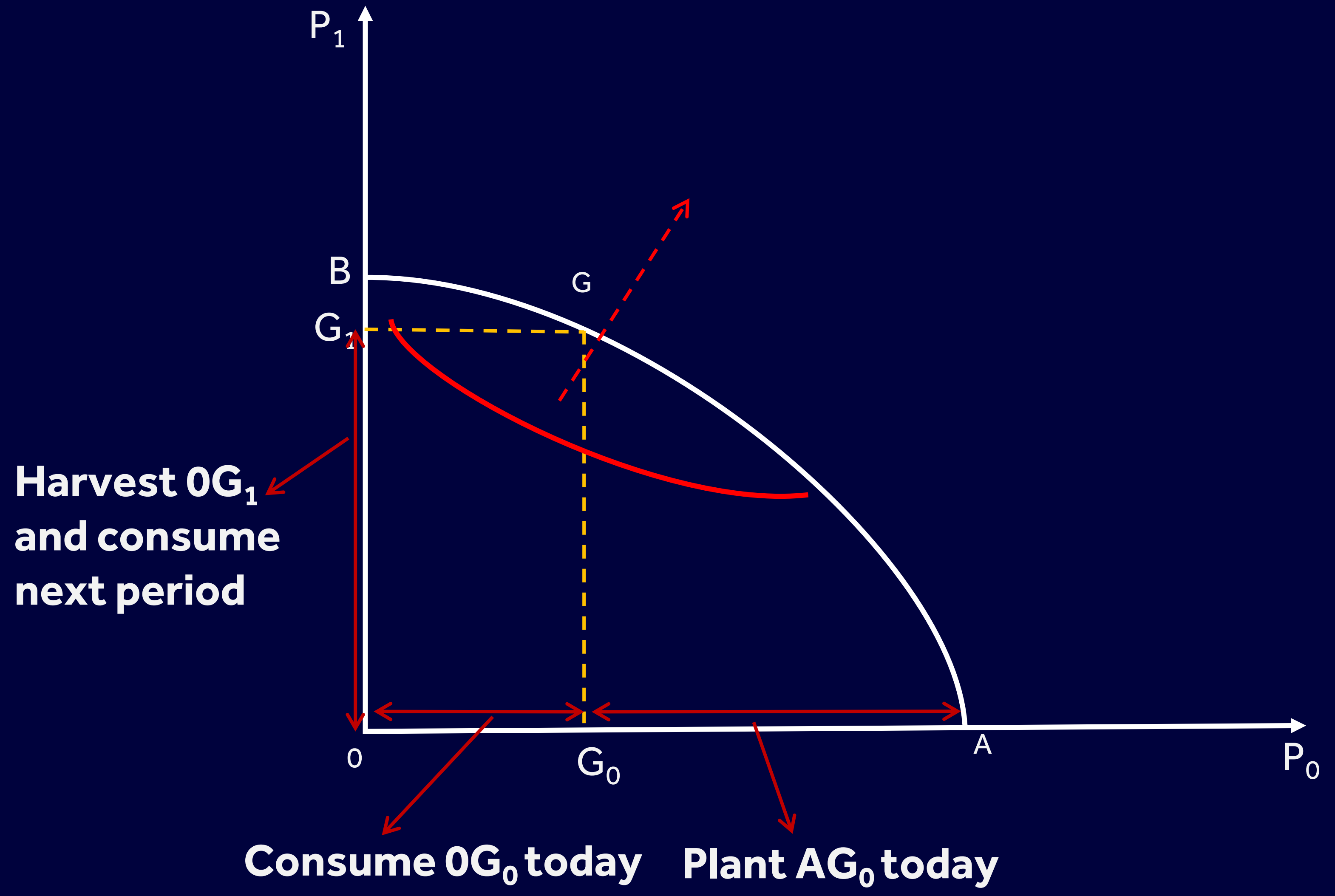
X or Z?

Preferences increase towards the right

Skipper's optimal decision



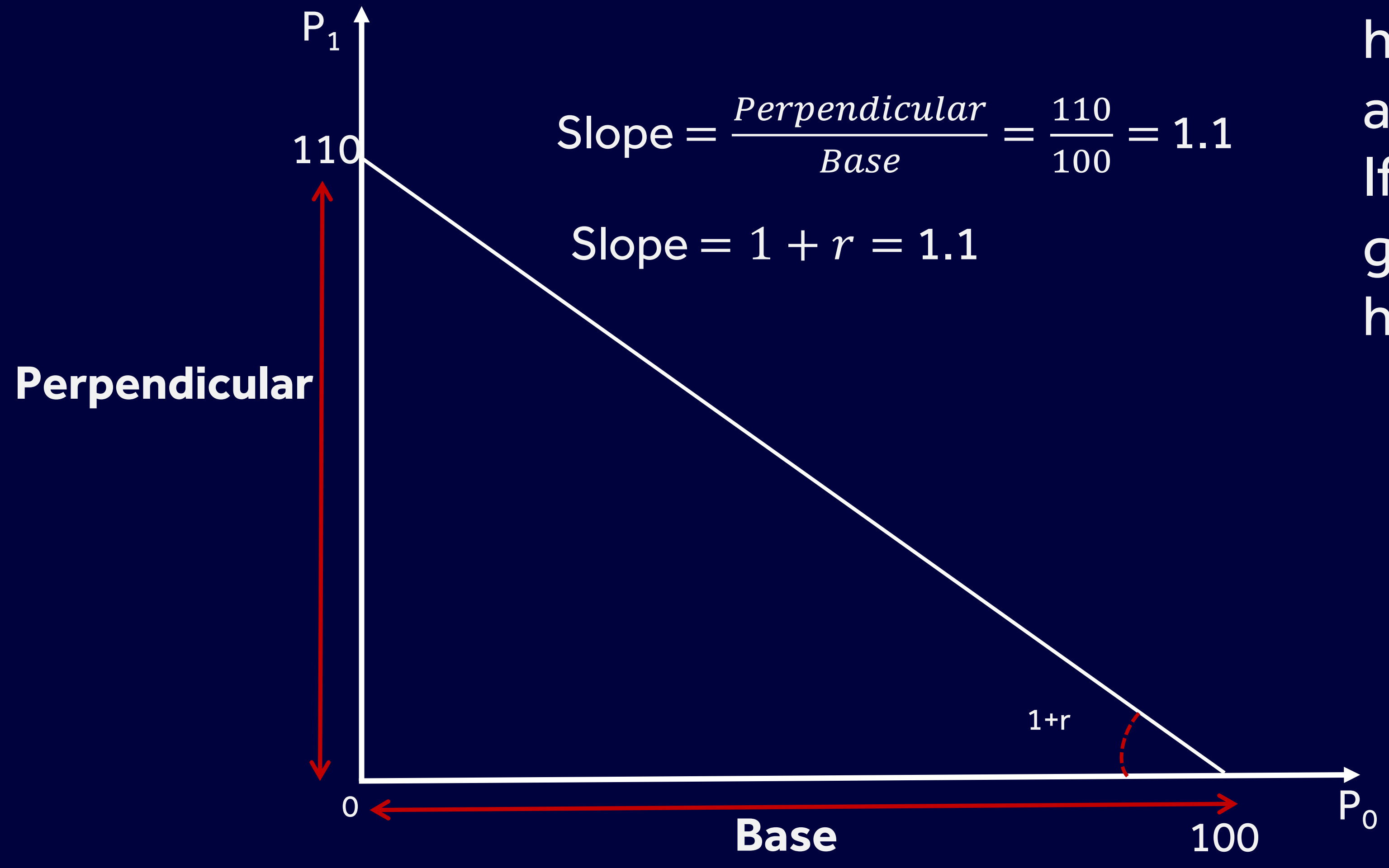
Ginger's optimal decision



Let's introduce a financial market

Robin Banks decides to start the IPE (Island Potato Exchange)

How does the market work?



$$\text{Slope} = \frac{Perpendicular}{Base} = \frac{110}{100} = 1.1$$

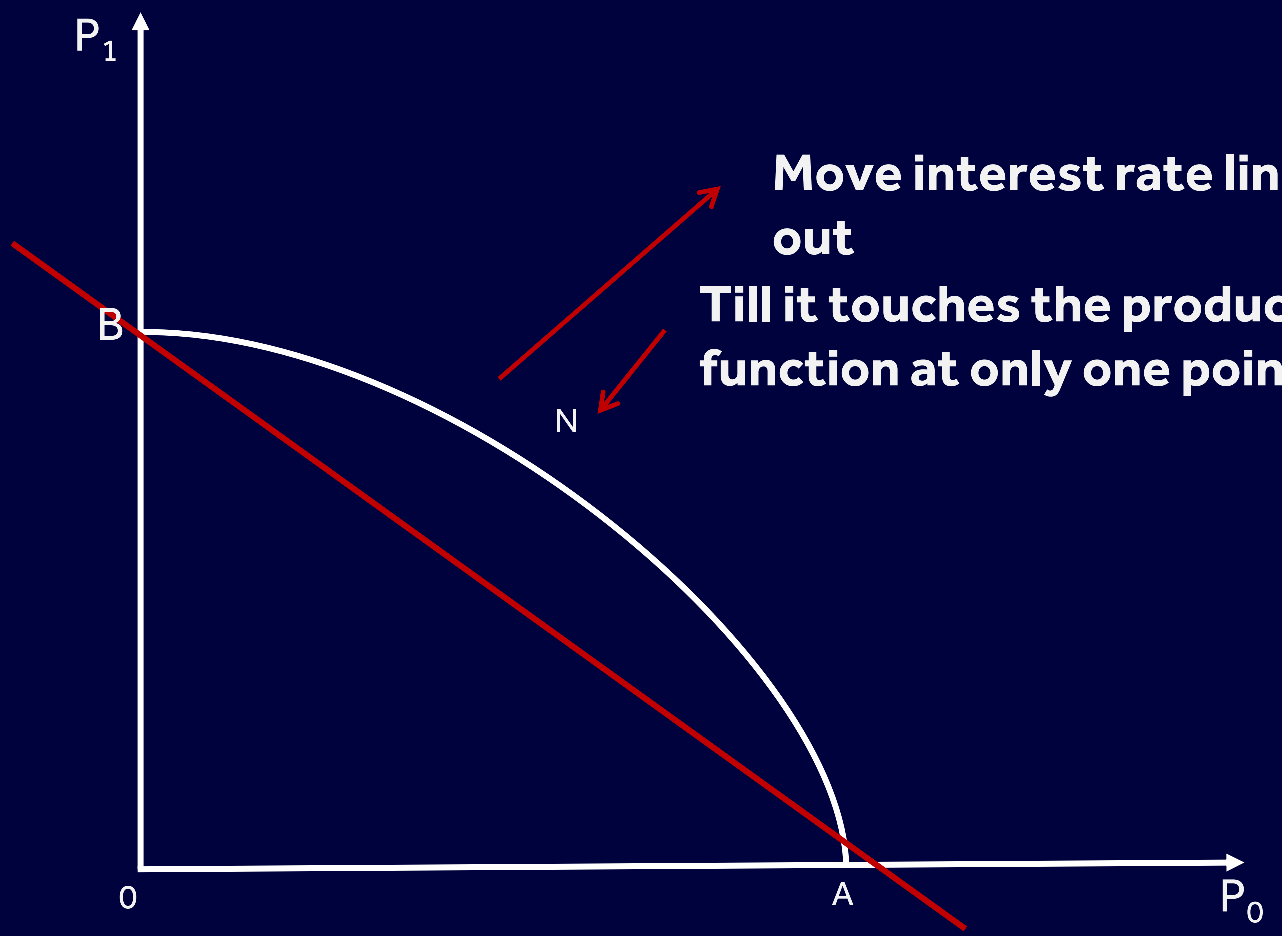
$$\text{Slope} = 1 + r = 1.1$$

Interest rate r

If you borrow 1 potato – you have to return (1+r) potatoes after harvest

If you lend 1 potato now, you get back (1+r) potatoes after harvest

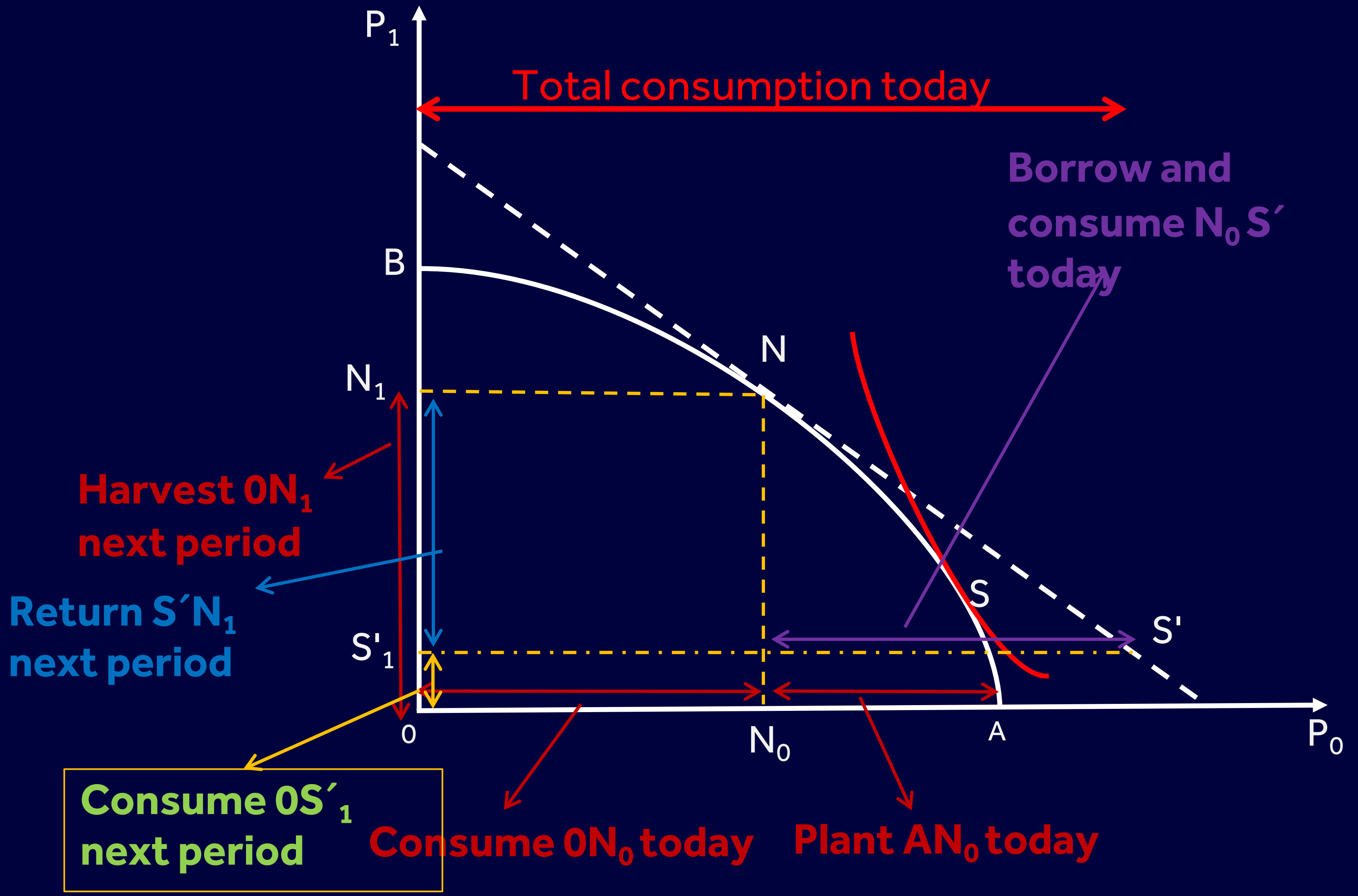
Optimal production decisions with capital markets



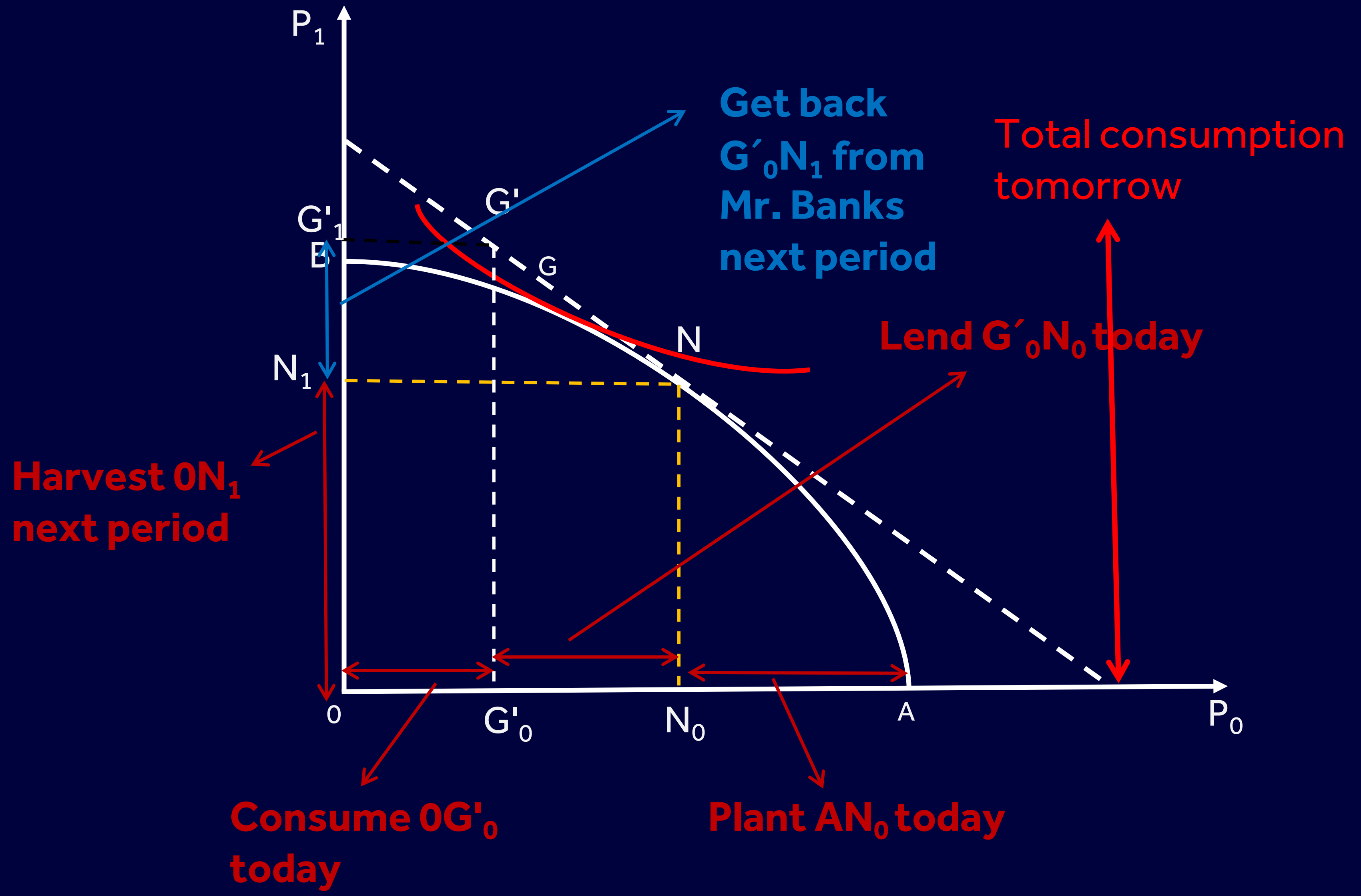
Move interest rate line out

Till it touches the production function at only one point

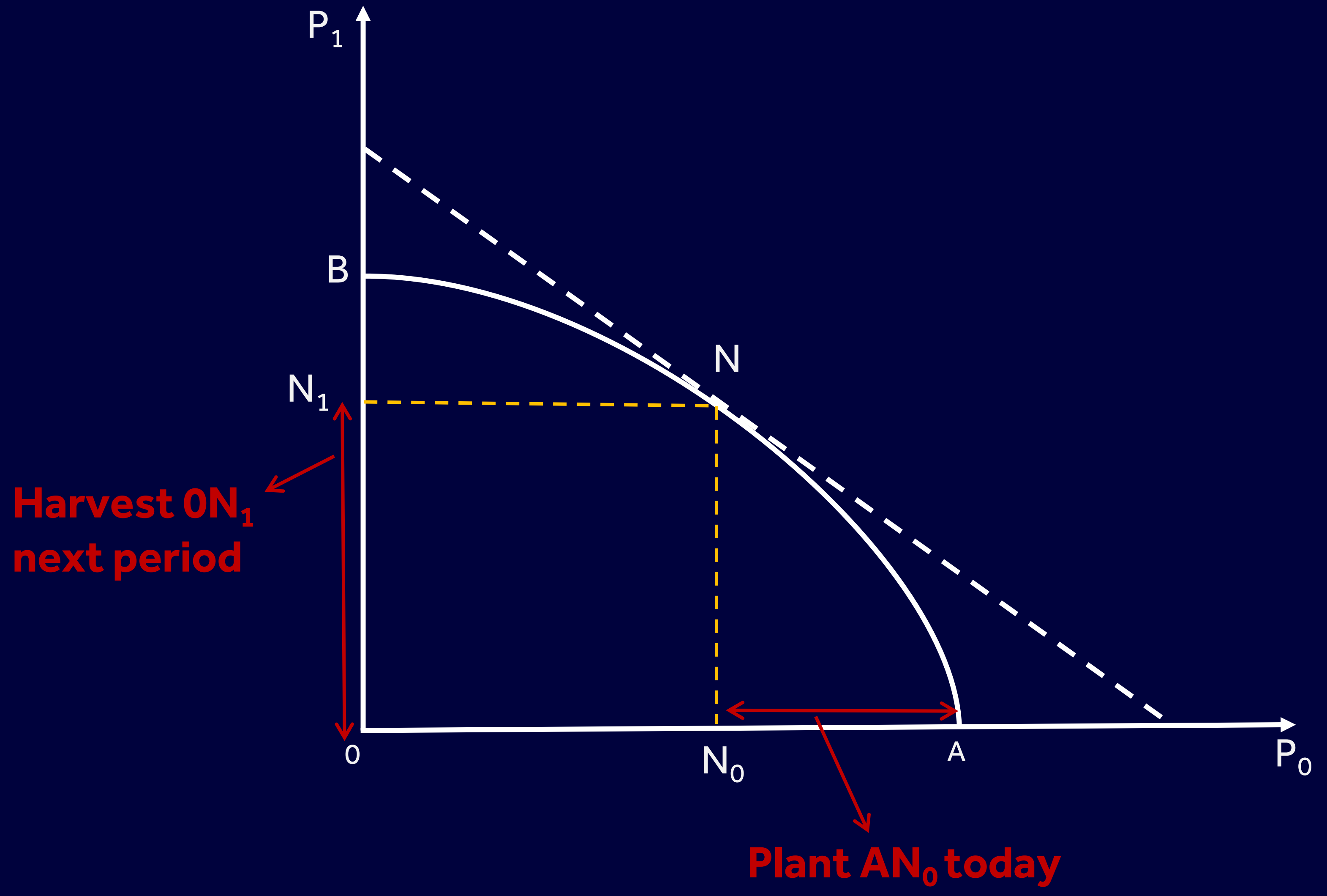
Skipper's optimal decision now



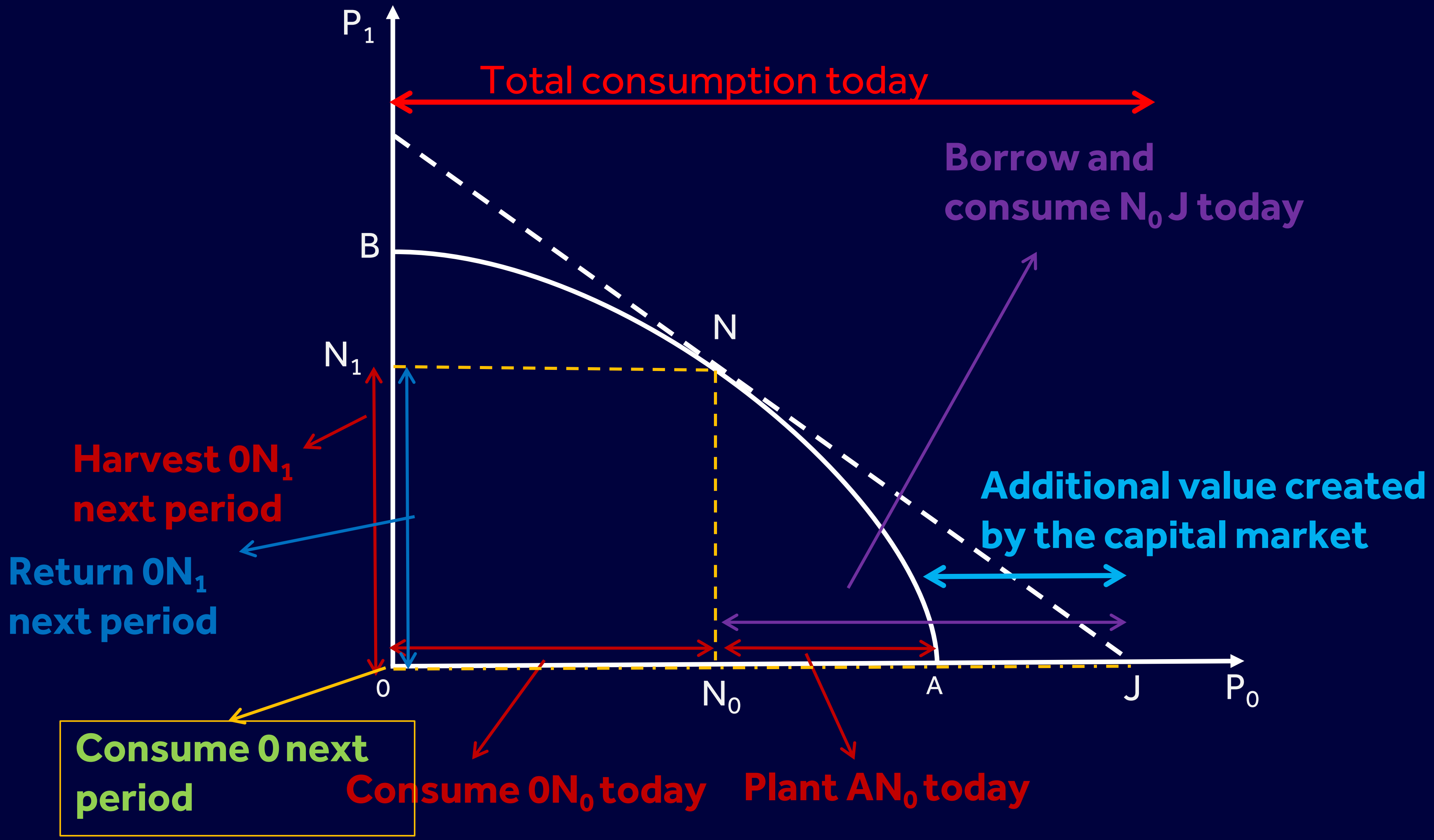
Ginger's optimal decision now



The key takeaway

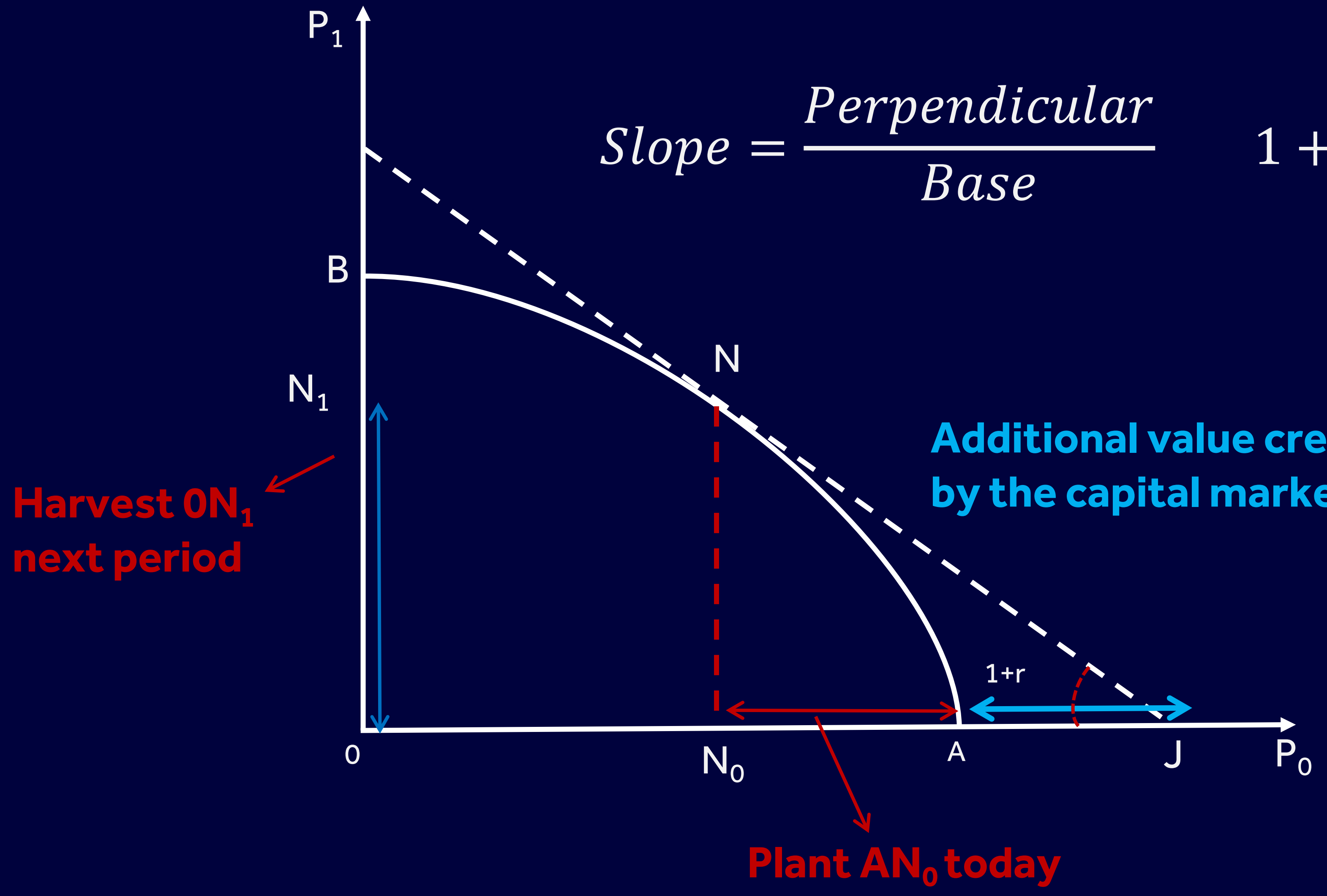


The absolute maximum Skipper could consume today



What is this additional value AJ?

$$Slope = \frac{Perpendicular}{Base} \qquad 1 + r = \frac{NN_0}{N_0 J}$$



What is this additional value AJ?

$$1 + r = \frac{NN_0}{N_0 J}$$

$$1 + r = \frac{NN_0}{N_0 A + AJ}$$

$$N_0 A + AJ = \frac{NN_0}{1 + r}$$

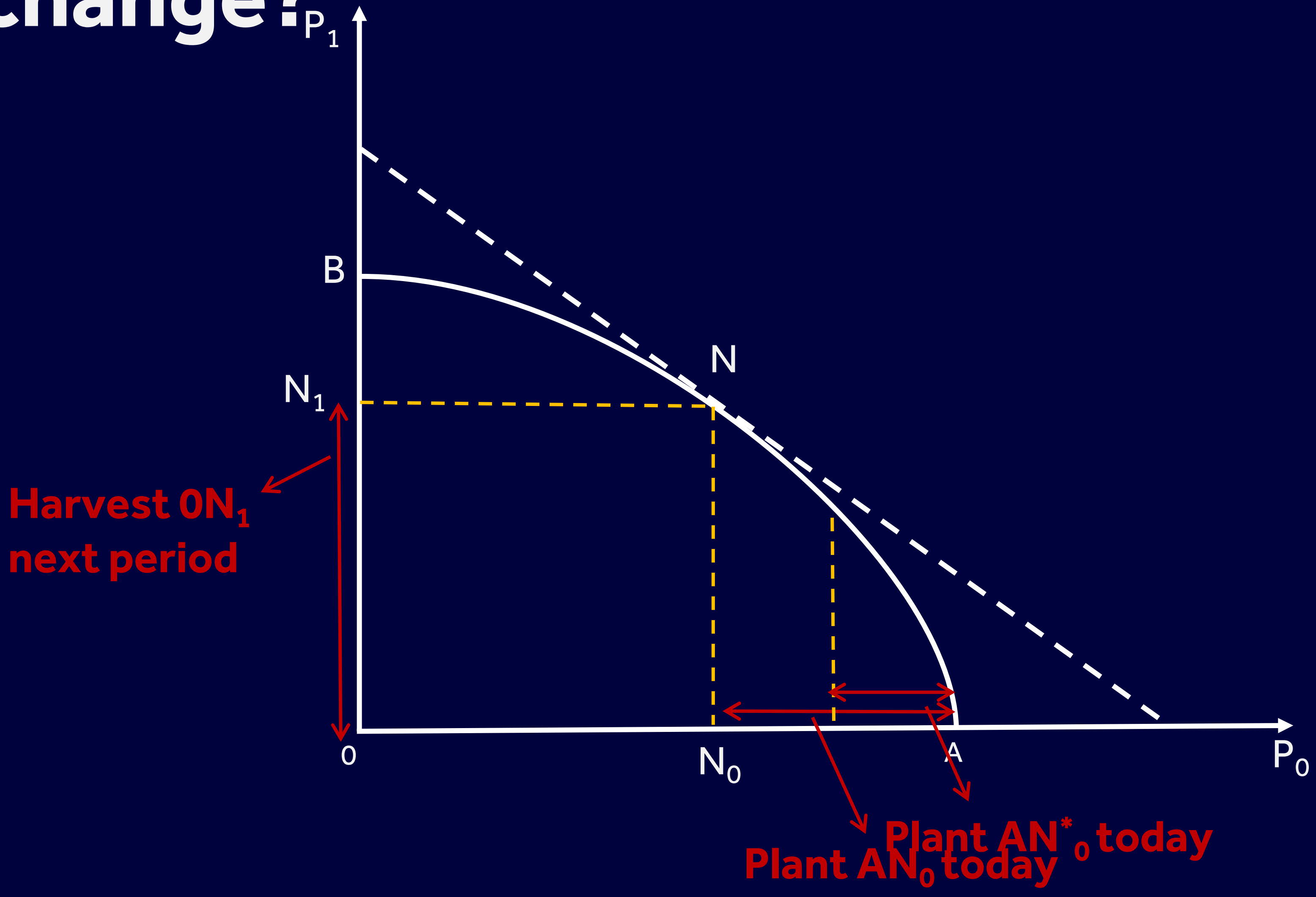
$$AJ = \frac{NN_0}{1 + r} - N_0 A$$

$$\boxed{NPV = \frac{CF_1}{1 + r} - I}$$

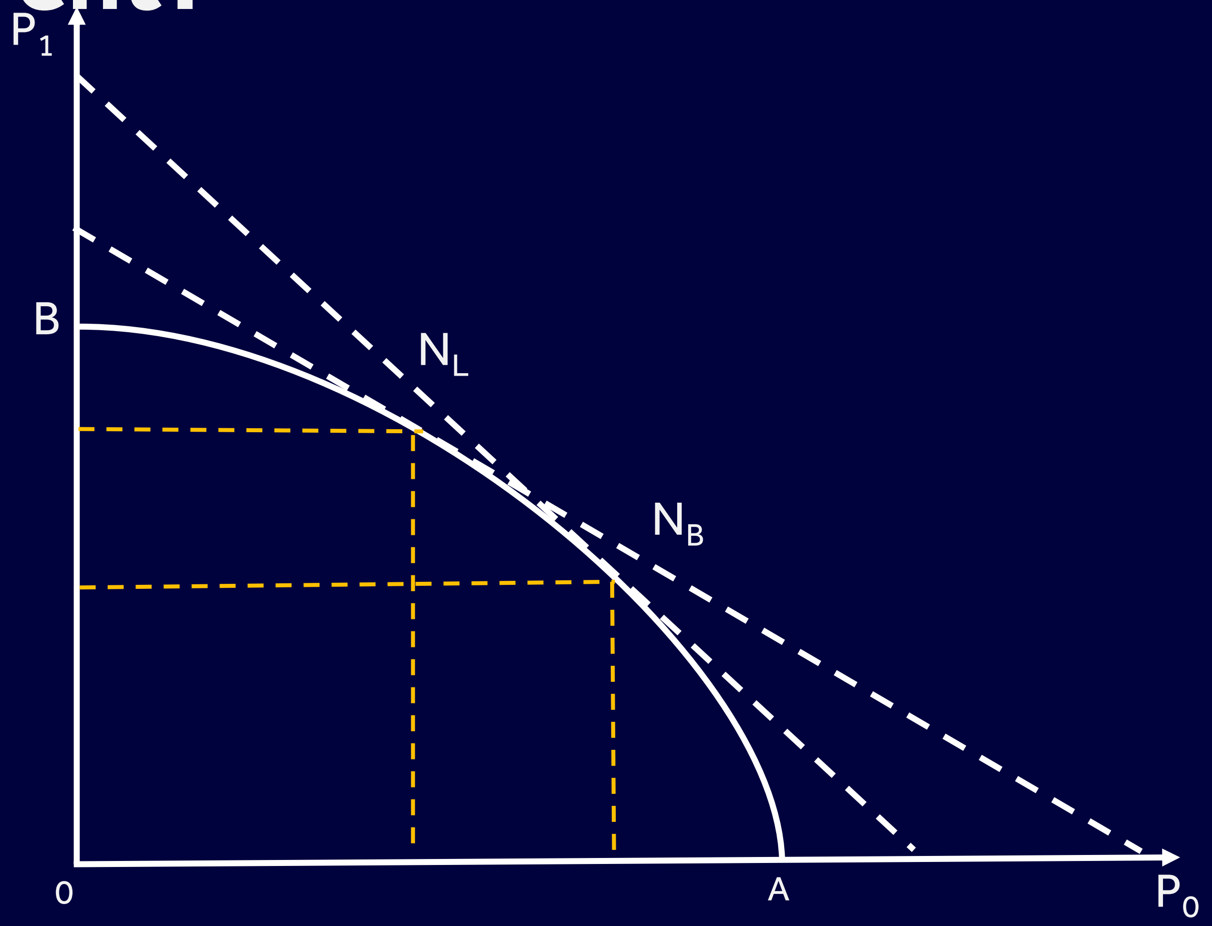
Conclusion

- Capital markets allow separation between investment and consumption decisions.
- This is called Fisherian Separation.
- As a manager, I don't really care about what my shareholders want. I just maximize the net present value of the investment.
- If the shareholders want more money than I give them in dividends, they can borrow.
- If they want less money than I give them, they can lend the money.

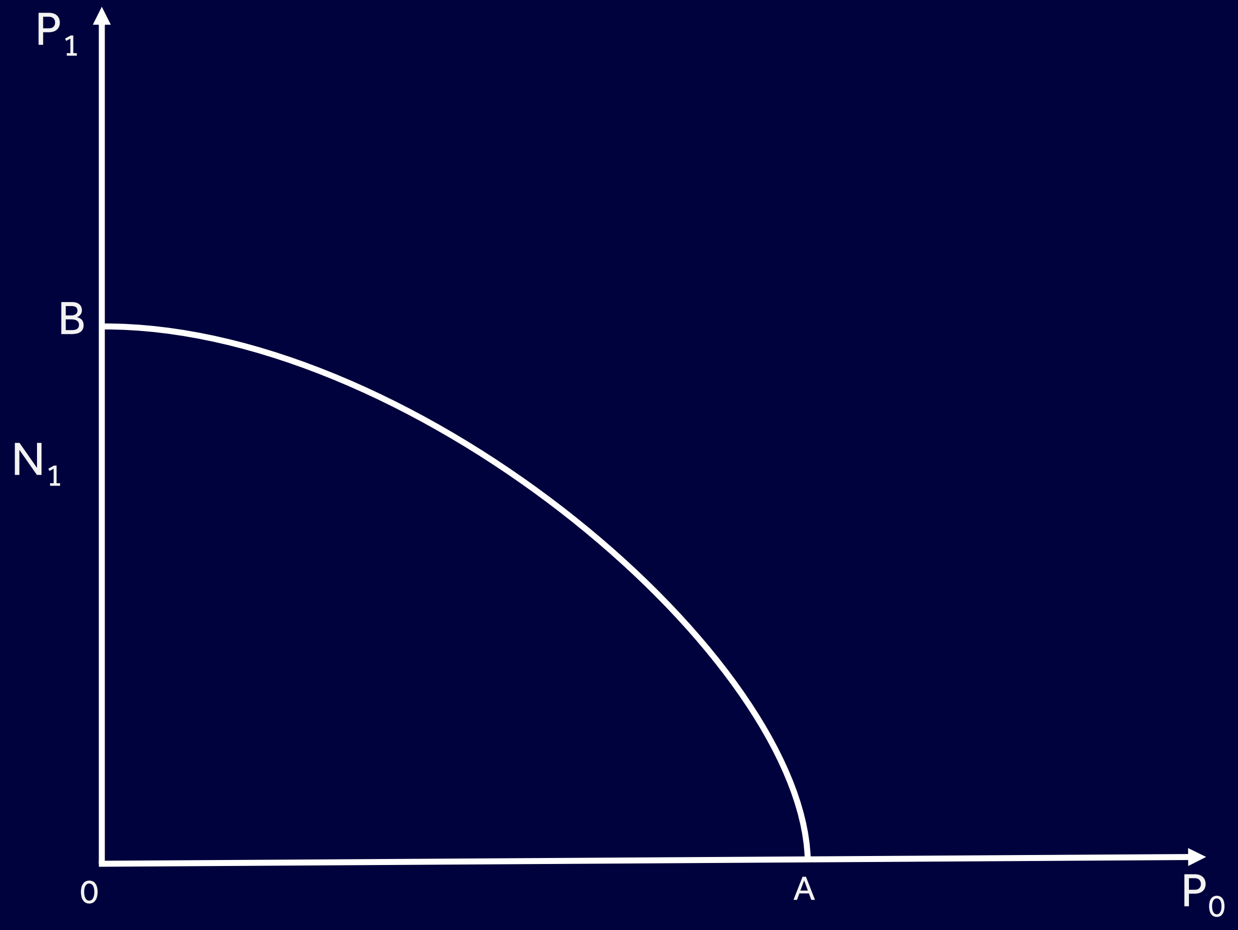
Problems? What happens if interest rates change?



What happens if borrowing rates and lending rates are different?



What happens if markets are not complete?



NPV

- This is the basic equation in finance.

- It is used everywhere where someone promises to give you something in the future in return for money today.

- The general formula is $PV = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \cdots$

- But we need to have an interest rate.