Preregistration: Mental Models of the Stock Market

Return Formula and Explaining Equilibrium Studies

Peter Andre, Philipp Schirmer, Johannes Wohlfart

August 6, 2024

In addition to the existing preregistration plan, we preregister the Return Formula and the Explaining Equilibrium Studies. These two studies are run as one data collection on Prolific.

Study parameters

- Sample size: 2,000 (about 500 per treatment)
- Sample type: Prolific sample (no quotas except balance with respect to gender)
- Start of data collection: August 6, 2024 (after preregistration)
- Number of arms: 4
- Randomization method: Computerized via Qualtrics
- We plan to work with all complete responses. In the (typically very rare) case that a respondent submits multiple responses, we only count the first response.
- Respondents can only start with the survey if they pass an attention screener. Moreover, they can only proceed with the survey if they pass a comprehension quiz that tests their understanding of the scenarios (multiple attempts are allowed).

Study design The survey consists of two parts. The first part of the survey contains the experimental manipulation. We implement four conditions.

Return Formula Study:

Control short Participants learn how the growth rate of a population is calculated, and in particular on how it depends on the difference between (i) the birth rate and (ii) the death rate.

Return formula treatment Participants learn how the return of a stock is calculated, and in particular on how it depends on the ratio between (i) the sum of the

dividend and the future stock price – which we label "future stock revenue" – and (ii) the current stock price.

Explain Equilibrium Study:

Control long Participants receive the same instructions as in the short control arm and, on top of this, learn that and why the growth rate of a population in a stable ecosystem does not depend on the resource richness of the environment.

Explain equilibrium treatment Participants receive the same instructions as in the return formula treatment and, on top of this, learn that and why the expected future success of a company is not a reliable indicator of the future success of an investment in its stock.

The second part is a shorter version of the main descriptive survey for households (see full instructions of the main survey). We only consider the *Nike good news* case and ask the following questions:

- Prediction: In all arms, respondents predict in which scenario the future expected return of an investment in the stock over the next year will be higher. In the return formula and the explain equilibrium conditions, participants are confronted with a modified prediction screen, on which they additionally predict the differences in the future stock revenue (dividend plus future stock price) and in the current stock price across the two scenarios, just before they predict the difference in the future return.
- Open-ended explanation of return prediction.
- Background characteristics.
- Question on the experimental hypothesis.

The precise instructions of the four conditions are attached below.

In comparison to the control conditions, the treatment conditions familiarize participants with the return formula or with the return formula *and* the consequences of equilibrium on stock markets. Other features such as text difficulty and length are comparable between the return formula treatment and the short control and comparable between the explain equilibrium treatment and the long control.

Research question Do individuals forecast old news to be relevant for future returns because they do not correctly apply the return formula? Or do they make such forecasts because they do not understand the consequences of equilibrium on stock markets?

We test whether explaining (i) the return formula or (ii) consequences of equilibrium on stock markets affects individuals' return expectations and the reasoning behind their expectations. To do this, we compare forecasts in the return formula treatment with the short control and forecasts in the explain equilibrium treatment with the long control.

Return formula condition

About this survey

This survey consists of two separate parts. Part 1 begins on the next page. Your task in part 1 is to understand how the return of a stock market investment is calculated.

We want you to read the explanation – which covers several pages of text – carefully so that, at the end of part 1, you can briefly restate what you learned in your own words.

[PAGE BREAK]

Stock returns

Stocks
The stock market is an exchange on which stocks are bought and sold. Stocks are shares of publicly held companies. If you hold them, you own a part (often tiny) of a company.

How can you earn money by holding stocks?
The **return** of an investment in a stock is the percent **change in value** that you receive from investing in that stock. It includes both dividend payments and the change in the stock price.

> Dividends: Regular payouts that companies transfer to their stockholders.
> Change in the stock price: The difference between the future price and the price at which you buy the stock.

In this survey, we do not distinguish between the two different sources of stock returns. When we speak of "return", we refer to the total return, which includes both elements. We provide a few examples below.

Examples
Imagine that you invest $100 in a stock. The table below shows the total value of the investment after 12 months for different rates of return.

Return over 12 months	Total value after 12 months	Change in value
20%	$120	$20
13%	$113	$13
4%	$104	$4
0%	$100	$0
-7%	$93	-$7

Expected returns
Future stock returns cannot be predicted with certainty. When we ask you to predict future returns, we are interested in your expected return, namely, the return that you expect for the future.

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Stock returns: A closer look

We will now look in more detail into how the return of a stock is computed. Let's think of an investment of $100 into the stock of a company.

The return is the change in value that you can achieve with the investment:

$$Return = Future\ value - Current\ value$$

You invest $100 – this will be the current value. But what is the future value?

[*Participants have to click on a "next" button to reveal paragraphs step by step. Each newly added paragraph is initially in bold.*]

[Participants click to reveal next step.]

You invest $100 – this will be the current value. But what is the future value?

For each stock that you can buy today, you earn (what we call) the "stock revenue": the future price of the stock and the dividend the stock pays:

$$Future\ stock\ revenue = Future\ stock\ price + Dividend\ per\ stock$$

[Participants click to reveal next step.]

For each stock that you can buy today, you earn (what we call) the "stock revenue": the future price of the stock and the dividend the stock pays:

$$Future\ stock\ revenue = Future\ stock\ price + Dividend\ per\ stock$$

To get at the future value, we have to multiply the number of stocks you can buy today with the future stock revenue:

$$Future\ value = Number\ of\ stocks \times Future\ stock\ revenue$$

[Participants click to reveal next step.]

To get at the future value, we have to multiply the number of stocks you can buy today with the future stock revenue:

$$Future\ value = Number\ of\ stocks \times Future\ stock\ revenue$$

To derive the number of stocks you can buy with $100 today, we need to divide the investment amount of $100 by the current stock price:

$$Number\ of\ stocks = \$100 / Current\ stock\ price$$

[Participants click to reveal next step.]

To derive the number of stocks you can buy with $100 today, we need to divide the investment amount of $100 by the current stock price:

Number of stocks = $100 / Current stock price

This means that the return will be:

$$\text{Stock return} = \$100 \times \frac{\text{Future stock revenue}}{\text{Current stock price}} - \$100$$

This means that the return is higher when you get a higher future stock revenue (future stock price + dividend) relative to the stock price you pay today.

Intuitively, this makes a lot of sense. The return is higher when you get more (future stock revenue) for what you pay (current stock price).

[PAGE BREAK]

Stock returns: A closer look

Recall: the return is higher when you get a higher future stock revenue (future stock price + dividend) relative to the stock price you pay today.

$$\text{Stock return} = \$100 \times \frac{\text{Future stock revenue}}{\text{Current stock price}} - \$100$$

This means ...

The stock return is high when ...
you get a lot of revenue relative to what you pay

High future stock revenue (what you get)
Low current stock price (what you pay)

Hence, when both the future stock revenue and the current stock price increase, the return **increases** whenever the future stock revenue increases proportionally **more** than the current stock price.

[PAGE BREAK]

Stock returns: A closer look

Recall: the return is higher when you get a higher future stock revenue (future stock price + dividend) relative to the stock price you pay today.

$$\text{Stock return} = \$100 \times \frac{\text{Future stock revenue}}{\text{Current stock price}} - \$100$$

This means...

The stock return is low when ...
you get little revenue relative to what you pay

$$\frac{\text{Low future stock revenue (what you get)}}{\text{High current stock price (what you pay)}}$$

Hence, when both the future stock revenue and the current stock price increase, the return **falls** whenever the future stock revenue increases proportionally **less** than the current stock price.

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Stock returns: A closer look

Recall: the return is higher when you get a higher future stock revenue (future stock price + dividend) relative to the stock price you pay today.

$$\text{Stock return} = \$100 \times \frac{\text{Future stock revenue}}{\text{Current stock price}} - \$100$$

This means ...

The stock return does not change when ...
the revenue relative to what you pay stays constant

Case 1 — *Returns identical* — Case 2

$$\frac{\text{High future stock revenue (what you get)}}{\text{High current stock price (what you pay)}} = \frac{\text{Low future stock revenue (what you get)}}{\text{Low current stock price (what you pay)}}$$

Hence, even when both the future stock revenue and the current stock price increase, the **return does not change** if the current stock price rises **in proportion** to the future stock revenue.

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Your explanation

Now, please describe what you just learned about stock returns in your own words.

[PAGE BREAK]

[. . .]

[PAGE BREAK]

Your predictions

Review the two scenarios *(click to open detailed description)*

▶ **Scenario 1: Nike maintains supplier partnership**
▶ **Scenario 2: Nike secures cost-saving partnership**

The announcements were made four weeks ago and received a lot of attention.

Imagine that you invest $100 in Nike stocks today, **four weeks after the announcement was made in the two scenarios**. Imagine that you sell these stocks in twelve months from now.

Now, we would like you to think about the return of this investment.

Recall: The return of a $100 stock investment is:

$$\text{Stock return} = \$100 \times \frac{\text{Future stock revenue}}{\text{Current stock price}} - \$100$$

This means that returns are higher when you get a higher future stock revenue (future stock price + dividend) relative to the stock price you pay today.

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Your predictions

Now, we would like you to think about the return of this investment. Let's approach this step by step.

First, Nike's expected **future stock revenue** in twelve months from now would be …

- ◯ **higher in scenario 1.**
- ◯ **similar in both scenarios.**
- ◯ **higher in scenario 2.**

Second, Nike's **stock price** today, four weeks after the announcement was made, would be …

- ◯ **higher in scenario 1.**
- ◯ **similar in both scenarios.**
- ◯ **higher in scenario 2.**

Finally, please think about the return.

The expected **return** of a $100 investment in Nike stock over the next twelve months would be …

- ◯ **higher in scenario 1.** This means that you expect the future stock revenue relative to the current stock price to be higher in scenario 1.
- ◯ **similar in both scenarios.** This means that you expect the future stock revenue relative to the current stock price to be similar in both scenarios.
- ◯ **higher in scenario 2.** This means that you expect the future stock revenue relative to the current stock price to be higher in scenario 2.

"Similar in both scenarios" means that the difference in returns is smaller than or equal to 0.5 percentage points.

Explain equilibrium condition

Participants first receive the same instructions as in the return formula condition, with the exception of the final page featuring the open text question. Then, they additionally receive the instructions shown below. The prediction screen later in the survey is identical to the one in the return formula condition, which is included above.

An important stock market principle

You just learned that the return on a stock investment is higher when you get a higher future stock revenue (future stock price + dividend) relative to the stock price you pay today.

But here is the crux: The current stock price usually depends on the future stock revenue expected by the market.

[*Participants have to click on a "next" button to reveal paragraphs step by step.*]

[Participants click to reveal next step]

A higher expected future stock revenue means that a stock is more attractive. Because more traders want to own the stock today, the current stock price is higher. Hence, you pay for the higher expected future stock revenue with a higher stock price today.

Even more: if stock prices accurately reflect what is known about the future, the expected future success of a company does not matter at all for the expected future return of an investment in this company.

[Participants click to reveal next step]

Yes, companies that are expected to perform well have a higher expected future stock revenue. But you also pay a higher price for their stock today because more traders want to own it. The combined effect is zero.

In fact, you can expect a similar return when investing in companies that are expected to perform worse. They have a lower expected future stock revenue, but you also pay a lower price for their stock today because fewer traders want to own it. And so the expected return of an investment in the company will be the same.

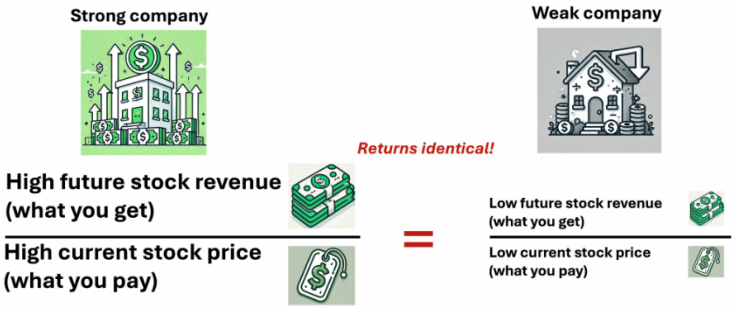
[PAGE BREAK]

An important stock market principle

Put simply, if stock prices accurately reflect what is known about the future, the expected future success of a company does not matter for the expected future return of an investment in the company's stock.

You get what you pay for, and you pay for what you get.

The expected return is the same.



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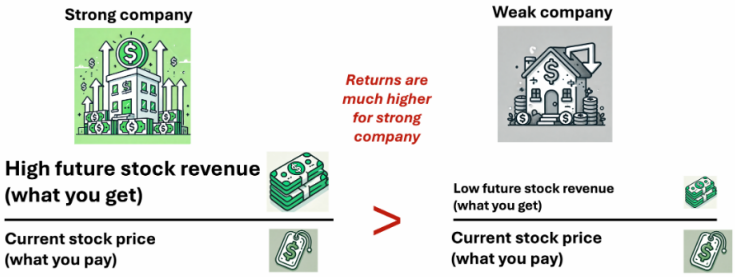
Why does the principle hold?

If stock prices accurately reflect what is known about the future, the expected future success of a company does not matter for the expected future return of an investment in the company's stock.

Why does the principle hold? This becomes clear if we think about what would happen if this principle did not hold.

Suppose that investing in high-earning companies was more lucrative than investing in low-earning companies because of their future expected earnings. This situation is unstable. Why? The answer involves four steps.

This situation is unstable.



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Why does the principle hold?

If stock prices accurately reflect what is known about the future, the expected future success of a company does not matter for the expected future return of an investment in the company's stock.

Why does the principle hold? This becomes clear if we think about what would happen if this principle did not hold.

Suppose that investing in high-earning companies was more lucrative than investing in low-earning companies because of their future expected earnings. This situation is unstable. Why? The answer involves four steps.

1. **Stock traders obviously love lucrative investments. Hence, they would want to hold more lucrative high-earning companies and less low-earning companies.**

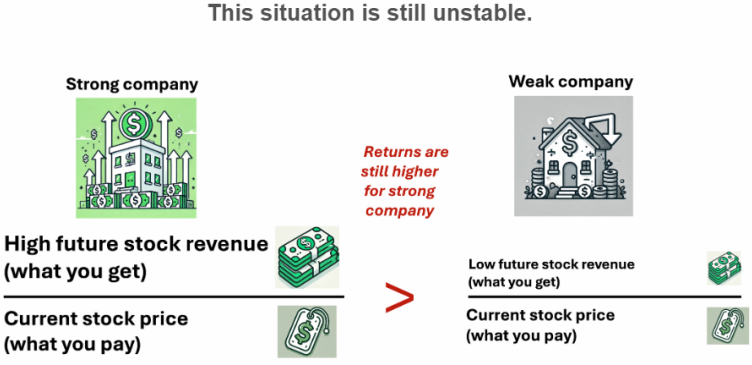
[*Participants have to click on a "next" button to reveal points 1–4 step by step. Each newly added step is initially in bold. For steps 3 and 4, the corresponding figure is shown.*]

[Participants click to reveal next step]

1. Stock traders obviously love lucrative investments. Hence, they would want to hold more lucrative high-earning companies and less low-earning companies.
2. **This would trigger a change in stock prices. The demand for the stock of high-earning companies would be so high that their stock prices would rise, while the demand for the stock of low-earning companies would be so low that their stock prices would fall.**

[Participants click to reveal next step]

2. This would trigger a change in stock prices. The demand for the stock of high-earning companies would be so high that their stock prices would rise, while the demand for the stock of low-earning companies would be so low that their stock prices would fall.
3. **Investing in high-earning companies just became less lucrative because their stocks are now more expensive. Investing in low-earning companies just became more lucrative because their stocks are now cheaper. But the situation is still unstable as long as traders continue to find the high-earning companies more lucrative.**



[Participants click to reveal next step]

3. Investing in high-earning companies just became less lucrative because their stocks are now more expensive. Investing in low-earning companies just became more lucrative because their stocks are now cheaper. But the situation is still unstable as long as traders continue to find the high-earning companies more lucrative.
4. **As long as investments in high-earning companies remain more lucrative, this process will continue. Traders will continue to trade, and prices will continue to change until the expected earnings of companies do not matter for expected stock returns anymore.**

Hence, in the end, we would be back in a situation where higher expected future earnings of a company do not come with a higher future expected return of investing into the company stock.

[PAGE BREAK]

Understanding expected returns

If the future expected success of a company does not directly matter for future stock returns, what does matter?

For example, risk could matter. Investments in some companies' stocks are more risky or offer less protection against low economic growth. Investors do not like risk. They have to be rewarded with higher expected future returns to bear this risk. Hence, riskier stocks will trade at a lower current price and have a higher return.

Market mistakes could matter. If stock prices — today or in the future — incorrectly reflect expected future stock revenues, you can expect a future return of a stock investment that can be higher or lower than usual.

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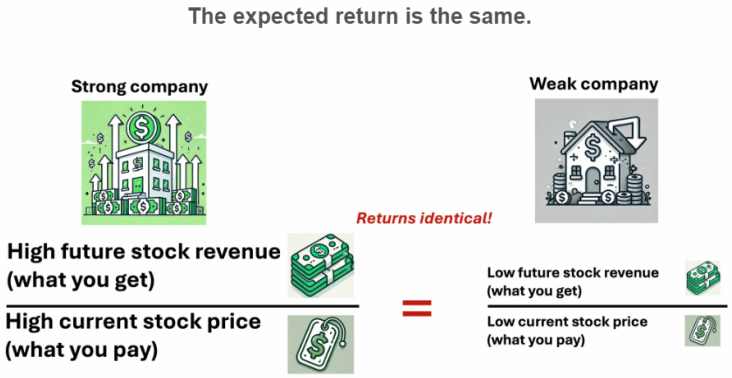
Summary

If stock prices accurately reflect what is known about the future, the expected future success of a company does not matter for the expected future return of an investment in the company's stock. You get what you pay for and you pay for what you get.



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Your explanation

Now, please describe the principle you just learned about in your own words.

Please explain why this principle holds in the stock market.

Short control condition

About this survey

This survey consists of two separate parts. Part 1 begins on the next page. Your task in part 1 is to understand how the growth rate of a population is calculated.

We want you to read the explanation – which covers several pages of text – carefully so that, at the end of part 1, you can briefly restate what you learned in your own words.

[PAGE BREAK]

Population growth: A closer look

We will now look in detail into how the growth of a population is computed. Let's think of a population of rabbits in a forest.

The growth is the change in population size over time:

Population growth = Future population size – Current population size

You start with a population of 100 rabbits – this will be the current population size. But what is the future population size?

[Participants have to click on a "next" button to reveal paragraphs step by step. Each newly added paragraph is initially in bold.]

[Participants click to reveal next step.]

You start with a population of 100 rabbits – this will be the current population size. But what is the future population size?

To get at the future population size, we first have to calculate the number of rabbits that will die between now and a future date. We will get at this by multiplying the current population size with the death rate – the fraction of the current population that will die:

Number of deaths = Current population size x Death rate

[Participants click to reveal next step.]

To get at the future population size, we first have to calculate the number of rabbits that will die between now and a future date. We will get at this by multiplying the current population size with the death rate – the fraction of the current population that will die:

Number of deaths = Current population size x Death rate

But we also need to calculate the number of rabbits that will be born between now and the future date. To get at this, we multiply the current population size with the birth rate – the number of births per rabbit:

Number of births = Current population size x Birth rate

[Participants click to reveal next step.]

But we also need to calculate the number of rabbits that will be born between now and the future date. To get at this, we multiply the current population size with the birth rate – the number of births per rabbit:

Number of births = Current population size x Birth rate

The future population size will be the current population size plus the number of births minus the number of deaths.

Future population size = Current population size
+ Current population size x Birth rate
– Current population size x Death rate

[Participants click to reveal next step.]

The future population size will be the current population size plus the number of births minus the number of deaths.

Future population size = Current population size
+ Current population size x Birth rate
– Current population size x Death rate

This means that population growth will be:

Population growth = (Birth rate – Death rate) x Current population size

This means that population growth is higher when the difference between the birth rate and the death rate is higher.

[PAGE BREAK]

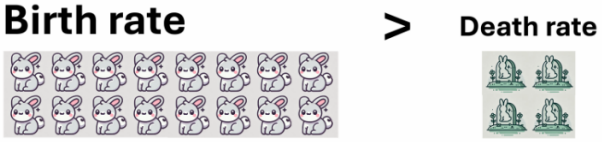
Population growth: A closer look

Recall: population growth is higher when the difference between the birth rate and the death rate is higher.

Population growth = (Birth rate – Death rate) x Current population size

This means ...

Population growth is high when ...
more rabbits are born than die



Hence, when both the birth rate and the death rate increase, the population growth is **higher** whenever the birth rate increases **more** than the death rate.

[PAGE BREAK]

Population growth: A closer look

Recall: population growth is higher when the difference between the birth rate and the death rate is higher.

Population growth = (Birth rate – Death rate) x Current population size

This means ...

Population growth is low when ...
more rabbits die than are born

Hence, when both the birth rate and the death rate increase, the population growth is **lower** whenever the birth rate increases **less** than the death rate.

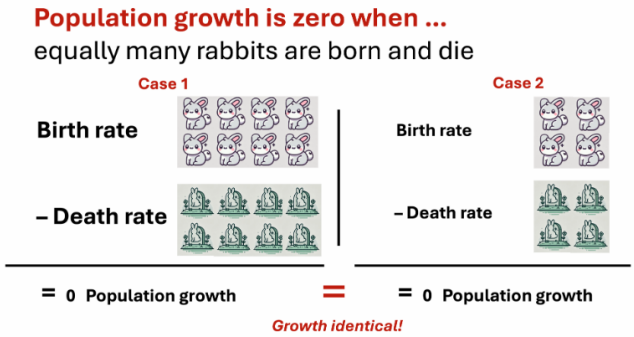
[PAGE BREAK]

Population growth: A closer look

Recall: population growth is higher when the difference between the birth rate and the death rate is higher.

Population growth = (Birth rate – Death rate) x Current population size

This means ...



Hence, even when both the birth rate and the death rate increase, the **population growth does not change** whenever the birth rate rises **by the same amount** as the death rate.

[PAGE BREAK]

Your explanation

Now, please describe what you just learned about population growth in your own words.

[PAGE BREAK]

Part 2

Now part 2 of the survey begins. In this part, we will ask you to predict the return of a stock in hypothetical scenarios.

[PAGE BREAK]

Stock returns

Stocks
The stock market is an exchange on which stocks are bought and sold. Stocks are shares of publicly held companies. If you hold them, you own a part (often tiny) of a company.

How can you earn money by holding stocks?
The **return** of an investment in a stock is the percent **change in value** that you receive from investing in that stock. It includes both dividend payments and the change in the stock price.

> Dividends: Regular payouts that companies transfer to their stockholders.
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In this survey, we do not distinguish between the two different sources of stock returns. When we speak of "return", we refer to the total return, which includes both elements. We provide a few examples below.

Examples
Imagine that you invest $100 in a stock. The table below shows the total value of the investment after 12 months for different rates of return.

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20%	$120	$20
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0%	$100	$0
-7%	$93	-$7

Expected returns
Future stock returns cannot be predicted with certainty. When we ask you to predict future returns, we are interested in your expected return, namely, the return that you expect for the future.

[PAGE BREAK]

Long control condition

Participants first receive the same instructions as in the short control condition, with the exception of the final three pages ("Your explanation", "Part 2", and "Stock returns"), which they only see later. Then, they additionally receive the following instructions.

An important ecological principle

You just learned that the growth of a population is higher when the difference between the birth rate and the death rate is higher.

But here is the crux: The birth rate and the death rate often adjust to the population size that the environment can sustain.

[*Participants have to click on a "next" button to reveal points 1–4 step by step. For steps 3 and 4, the corresponding figure is shown.*]

[Participants click to reveal next step.]

A higher birth rate means more rabbits are born. But if the environment cannot support more rabbits, the death rate increases due to competition for resources. Hence, the population stabilizes.

Even more: if the population size has reached the level the environment can sustain, the population stays constant regardless of the number of resources the environment offers.

[Participants click to reveal next step.]

Yes, populations in a rich environment with abundant resources may have a higher birth rate. But they also have a higher death rate due to competition. The combined effect is zero.

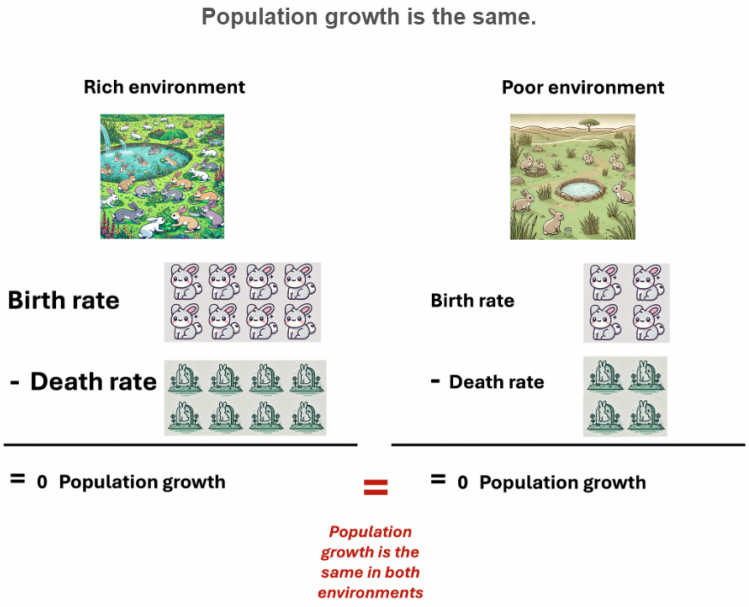
In fact, population growth will be the same in less resourceful environments that are in ecological balance. Such environments may have a lower birth rate, but also have a lower death rate due to less competition. And so population growth will be zero as well.

[PAGE BREAK]

An important ecological principle

Put simply, once the population size has reached the level the environment can sustain, the amount of resources offered by the environment does not matter for population growth.

Population growth will be zero both in a resource-rich and in a resource-poor environment.



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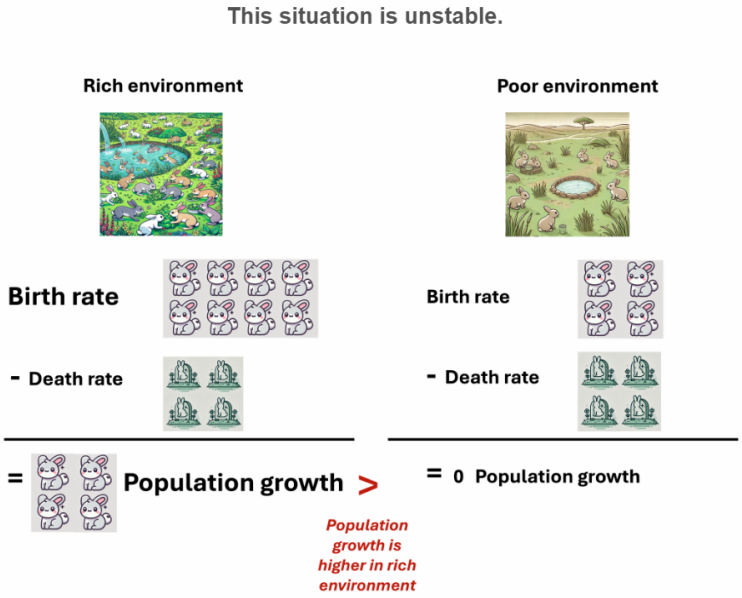
Why does the principle hold?

Once the population size has reached the level the environment can sustain, the amount of resources offered by the environment does not not matter for population growth.

Why does the principle hold? This becomes clear if we think about what would happen if this principle did not hold.

Suppose that population growth was positive in a resource-rich environment because of a high birth rate. This situation is unstable. Why? The answer involves four steps.



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Why does the principle hold?

Once the population size has reached the level the environment can sustain, the amount of resources offered by the environment does not not matter for population growth.

Why does the principle hold? This becomes clear if we think about what would happen if this principle did not hold.

Suppose that population growth was positive in a resource-rich environment because of a high birth rate. This situation is unstable. Why? The answer involves four steps.

1. **If population growth was positive, the number of rabbits in the environment would become larger and larger.**

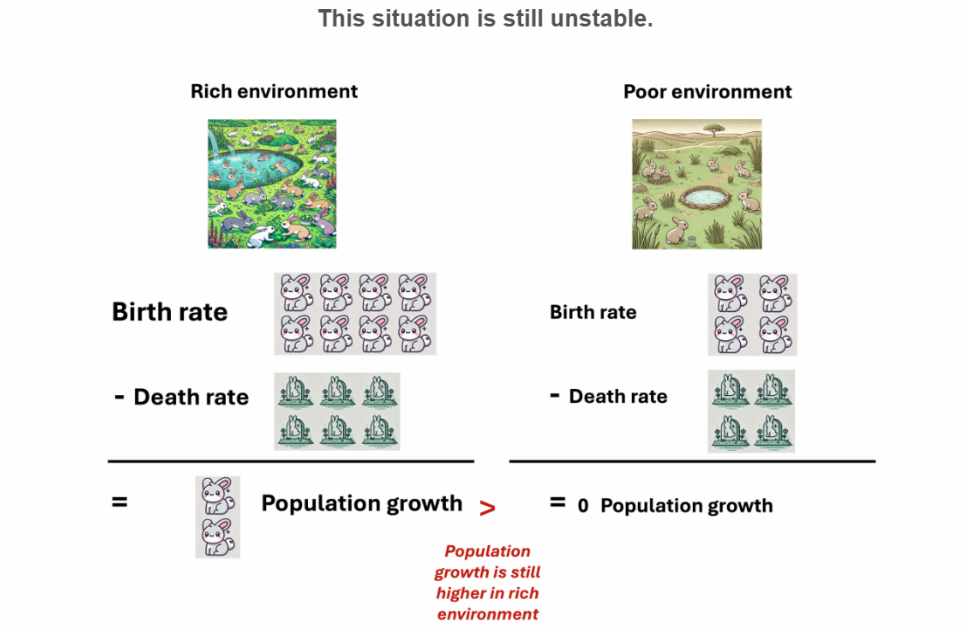
[*Participants have to click on a "next" button to reveal points 1–4 step by step. Each newly added step is initially in bold. For steps 3 and 4, the corresponding figure is shown.*]

[Participants click to reveal next step.]

1. If population growth was positive, the number of rabbits in the environment would become larger and larger.
2. **At some point, there would be more rabbits than the environment can sustain, despite the large amount of resources available in the environment.**

[Participants click to reveal next step.]

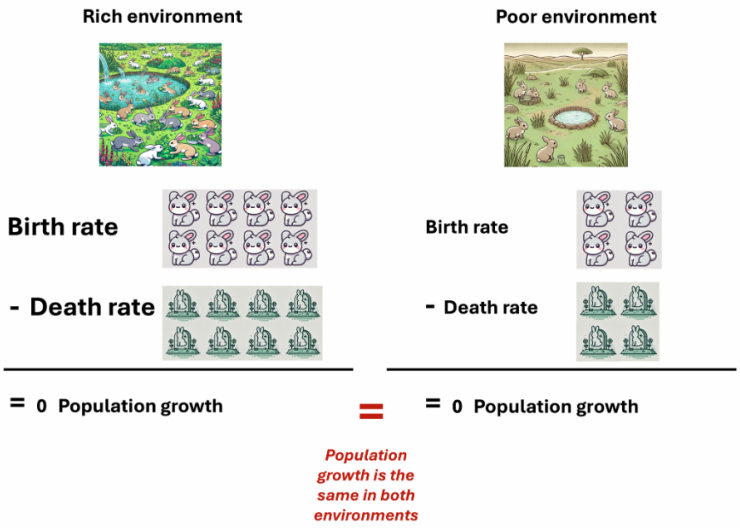
2. At some point, there would be more rabbits than the environment can sustain, despite the large amount of resources available in the environment.
3. **This would trigger an increase in competition for the available resources. More rabbits would end up not being able to survive, increasing the death rate. But the situation is still unstable as long as the population continues to grow in the resource-rich environment.**



[Participants click to reveal next step.]

3. This would trigger an increase in competition for the available resources. More rabbits would end up not being able to survive, increasing the death rate. But the situation is still unstable as long as the population continues to grow in the resource-rich environment.
4. **As long as the population still grows, this process will continue. Competition will continue to increase, and the death rate will continue to increase until population growth is zero and the population stabilizes on the level that the environment can sustain.**

This is the only stable situation.



Hence, in the end, we would be back in a situation where the higher amount of resources available in the environment does not come with a higher population growth.

[PAGE BREAK]

Understanding population growth

If the amount of resources in the environment often does not directly matter for population growth, what does matter?

For example, changes in the environment could matter. If the environment changes, say, because of new predators entering the environment or changes in the climate, then population growth may be positive or negative for some time, until ecological balance is restored.

When the number of rabbits is higher or lower due to a temporary factor, this could matter as well. For instance, an unusually hard winter could lead to a lower number of rabbits than what the environment can sustain under normal circumstances. Population growth may then be positive until ecological balance is restored.

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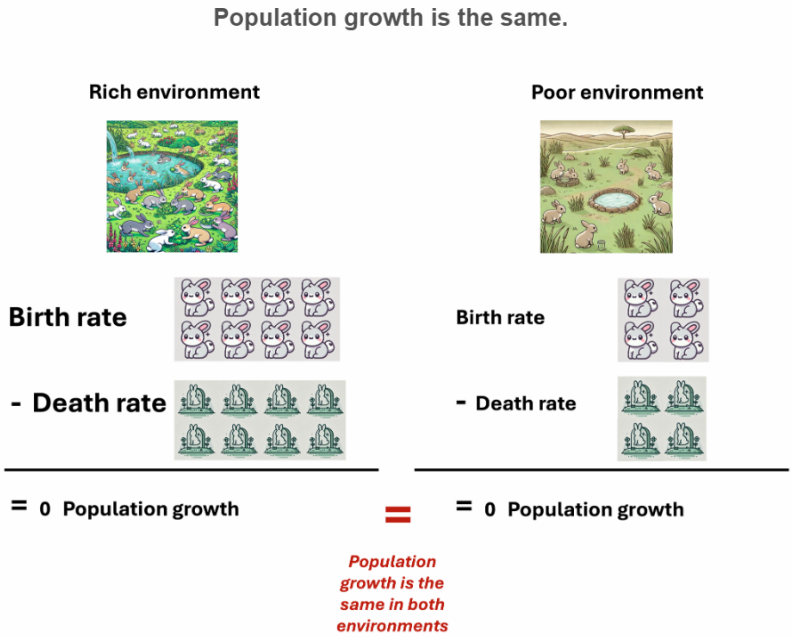
Summary

If population size has reached the level the environment can sustain, the amount of resources in the environment does not matter for population growth.

Population growth will be zero both in a resource-rich and in a resource-poor environment.



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Your explanation

Now, please describe the principle you just learned about in your own words.

Please explain why this principle holds in population dynamics.

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Part 2

Now part 2 of the survey begins. In this part, we will ask you to predict the return of a stock in hypothetical scenarios.

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Stock returns

Stocks
The stock market is an exchange on which stocks are bought and sold. Stocks are shares of publicly held companies. If you hold them, you own a part (often tiny) of a company.

How can you earn money by holding stocks?
The **return** of an investment in a stock is the percent **change in value** that you receive from investing in that stock. It includes both dividend payments and the change in the stock price.

> Dividends: Regular payouts that companies transfer to their stockholders.
> Change in the stock price: The difference between the future price and the price at which you buy the stock.

In this survey, we do not distinguish between the two different sources of stock returns. When we speak of "return", we refer to the total return, which includes both elements. We provide a few examples below.

Examples
Imagine that you invest $100 in a stock. The table below shows the total value of the investment after 12 months for different rates of return.

Return over 12 months	Total value after 12 months	Change in value
20%	$120	$20
13%	$113	$13
4%	$104	$4
0%	$100	$0
-7%	$93	-$7

Expected returns
Future stock returns cannot be predicted with certainty. When we ask you to predict future returns, we are interested in your expected return, namely, the return that you expect for the future.

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