Asset Markets

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Assets are goods that provide a flow of services over time. Assets can provide a flow of consumption services, like housing services, or can provide a flow of money that can be used to purchase consumption. Assets that provide a monetary flow are called financial assets.

1 Rates of Return

We will examine the functioning of asset markets under conditions of complete certainty about the future flow of services provided by the asset, which implies that, under no uncertainty about the cash flow provided by assets, then all assets have to have the same rate of return.

Let's study the following situation:

- An **asset A** that has current price p_0 and is expected to have a price of p_1 tomorrow. Everyone is certain about what today's price of the asset is, and everyone is certain about what tomorrow's price will be. And, we suppose for simplicity that there are no dividends or other cash payments between periods 0 and 1.
- An **asset B**, that one can hold between periods 0 and 1 that will pay an interest rate of r.

Now, we consider 2 investment plans:

1. Invest 1$ in asset A and cash it in next period
2. Invest 1$ in asset B and ear the interest of r dollar over the period

Let's jump straight to the analysis, we need to know how many units of the asset A will be bought with 1$, which is easy to determine. By calling x this amount we have the following equation:

$$p_0 \cdot x = 1 \longleftrightarrow x = \frac{1}{p_0}$$

Then, the future value (FV) of one dollar's worth of this asset A next period will be:

$$FV = p_1 \cdot x = \frac{p_1}{p_0}$$

On the other hand, under the investment of asset B, the user will obtain a rate of return of r for each dollar invested, therefore by investing just 1$ he obtains $(1 + r)$. Under the equilibrium condition, it is ensured that the returns from two investment strategies are equal, therefore we would have:

$$1 + r = \frac{p_1}{p_0}$$

If the equilibrium condition $1 + r = \frac{p_1}{p_0}$ is not satisfied, arbitrage opportunities arise. For example, if $1 + r > \frac{p_1}{p_0}$, people can sell asset A at price p_0, invest the proceeds in asset B, and earn $p_0(1 + r)$ by the next period, which is greater than p_1. This allows them to repurchase asset A and still have extra money, making a risk-free profit.

This process, called **arbitrage**, ensures that markets quickly adjust to eliminate these opportunities. In this case, the price of asset A (p_0) would fall because everyone would want to sell it, increasing its supply and lowering its price until $1 + r = \frac{p_1}{p_0}$. Thus, the no-arbitrage condition guarantees that well-functioning markets reach equilibrium by eliminating riskless profit opportunities.

1.1 Real-Life Comparison

Private stocks align perfectly with strategy A. Here's how:

- Private Stocks

  When you invest in private stocks, you are buying a tangible share of ownership in a company. The return on your investment depends on the price of the stock in the future, which can vary due to market conditions, company performance, and broader economic factors.

- Initial Investment: You purchase $x = \frac{1}{p_0}$ units of stock for \$1, where p_0 is the stock price today.
- Future Value: The value of your investment after one period depends on the future stock price p_1. The total value of your shares is:

$$FV = p_1 \cdot x = \frac{p_1}{p_0}.$$

Imagine you buy shares of a tech company today at a price of p_0 =50\$. With \$1, you can purchase $x = \frac{1}{50} = 0.02$ shares. If the stock price increases to p_1 =60\$, the future value of your investment is:

$$FV = p_1 \cdot x = 60 \cdot 0.02 = 1.20.$$

You've earned a return of 20%. However, if the stock price drops to p_1 =40\$, the future value is:

$$FV = p_1 \cdot x = 40 \cdot 0.02 = 0.80,$$

and you incur a 20% loss.

A real-life example of **strategy B**, where the user doesn't "possess" a tangible asset but still earns a return, can be found in financial instruments like bank savings accounts, government bonds or treasury bills. Here's how:

- Bank Savings Account

  When you deposit money in a savings account, you don't physically possess a tangible asset. Instead, the bank uses your deposit and pays you a fixed return (interest rate r) for allowing them to hold and use your money. Your investment grows over time at a guaranteed rate, but you don't own a specific physical or financial asset tied to your deposit. The return is calculated based solely on the agreed interest rate and your principal amount.

  - Initial Investment: \$1 deposit.
  - Return Rate: Suppose the interest rate is $r = 5\%$.
  - Future Value: After one period, your deposit grows to $1 + r = 1 + 0.05 = 1.05$.

  You earn the return r simply by trusting the bank to grow your money, without buying or owning any tangible or tradable asset.

- Government Treasury Bills

  Treasury bills (T-bills) are short-term debt instruments issued by the government. When you invest in a T-bill, you're essentially lending money to the government in exchange for a fixed return. You don't "own" the government or any physical asset but are guaranteed a return (the interest rate).

  - Initial Investment: \$1 in a T-bill.
  - Return Rate: Suppose $r = 3\%$.
  - Future Value: After maturity, the government repays your principal plus interest, giving you $1 + r = 1 + 0.03 = 1.03$.

  Again, you're not possessing an asset in the traditional sense, but you're earning a return through a contractual agreement.

- Government Bonds:

  A government bond is essentially a loan you give to the government in exchange for a fixed return (interest). In this case, you're not physically owning a tangible asset like a house or shares in a company; instead, you're holding a contract promising a future payoff.

  - Initial Investment: You buy the bond for \$1 today.
  - Return Rate: The government guarantees an interest rate, say $r = 5\%$.
  - Future Value: At the end of the period, you receive $1 + r = 1 + 0.05 = 1.05$, which includes your initial investment plus interest.

1.2 Arbitrage and Present Value

Present value represents the value of an asset today (p_0) based on its expected future value (p_1) discounted by the return rate $(1+r)$.

$$1+r=\frac{p_1}{p_0} \longleftrightarrow p_0=\frac{p_1}{1+r}$$

The return rate r reflects the time value of money, meaning that a dollar today is worth more than a dollar in the future because money can earn interest or returns over time. By dividing p_1 (the future value of the asset) by $1+r$, we adjust the future value back to its equivalent value today, accounting for the opportunity cost of not investing that money elsewhere. This concept links the future value of the asset to its fair price in the present, hence the term present value.

2 Assets with Consumption Returns

2.1 Implicit Rental Rate, Appreciation and Total Return

An asset with consumption returns is an asset that not only generates monetary returns but also provides direct consumption benefits.

For example, **owning a house provides "consumption returns"** when the mortgage has been completely paid off because you can live in it, saving on rent (return of the house asset), in addition to any financial returns you might earn if the house increases in value, which we define as appreciation and we will denote it as A.

The implicit rental rate can be thought of as the rent T you could earn if you rented the house to someone else instead of living in it. By choosing to live in the house, you're giving up the opportunity to earn that rental income. This opportunity cost is what we call the implicit rental rate.

The purpletotal return to owning the house is defined as the sum of the rental return T and the investment return A divided by the initial investment cost P:

$$h=\frac{T+A}{P}=\frac{T}{P}+\frac{A}{P}$$

Where $\frac{T}{P}$ is the consumption rate of return (also called consumption benefit rate of return) and $\frac{A}{P}$ the investment rate of return (also called financial rate of return).

For instance, if your house could be rented out for $\$12,000$ a year, that $T=\$12,000$ represents your implicit rental income - the benefit you're getting by living in the house yourself instead of renting it out, and if the value of your house increases by $\$8,000$ over the same year, i.e the appreciation, that $\$8,000$ represents your **investment return**. If the initial and total cost of the house was $P=\$200,000$, the total return h to owning the house would be:

$$h=\frac{T+A}{P}=\frac{12,000+8,000}{200,000}=0.10\,\text{or}\,10\%.$$

This 10% return reflects both the implicit rental income ($\$12,000$) and the appreciation in the house's value ($\$8,000$), divided by the initial purchase cost.

It's important to notice that assets that provide consumption benefits (like houses, paintings, or jewelry) typically have a lower financial rate of return compared to purely financial assets, such as stocks or bonds. This is because part of their price reflects the value people place on the enjoyment or use they get from owning them, like living in a house or admiring a painting.

As a result,buying such assets solely for financial gain is often not the best idea since their financial return is usually lower. However, if you personally value the consumption benefits (e.g., the joy of living in the house or wearing the jewelry) or can generate income from them (like renting out the house), the total return - financial plus consumption return - might justify the purchase. This makes such investments worthwhile if the non-financial benefits are significant to you.

3 Taxation of Asset Returns

The Internal Revenue Service (IRS) (Agencia Tributaria Española) separates asset returns into two categories for taxation: dividends/interest and capital gains.

- Dividends and interest are paid periodically (e.g., monthly or annually) during the life of an asset and are taxed at the same rate as ordinary income, such as wages or salaries.
- Capital gains, on the other hand, occur when you sell an asset for more than you paid for it. These are taxed only at the time of sale, and while currently taxed at the same rate as ordinary income, there are discussions about reducing this rate to encourage investment.

The claim that taxing capital gains and ordinary income at the same rate is "neutral" is debatable for two main reasons:

3.1 Tax deferral on capital gains vs on dividends

Taxes on dividends and interest are paid annually, while capital gains taxes are deferred until the asset is sold. This deferral effectively lowers the real tax rate on capital gains compared to ordinary income because the tax liability is delayed, allowing the gains to compound over time without immediate taxation.

For instance, let's consider both situations:

- Taxes on dividends: Suppose you invest \$1,000 in an asset that grows at a rate of 8% annually over 10 years. Assume a tax rate of 25% on both capital gains and dividends/interest. If the asset pays annual interest (or dividends) at 8%, you earn \$80 every year and pay 25% tax on that, or \$20 annually (\$80 × 25%\$20). Over 10 years, you pay: $10 \cdot 20 = \$200$ in taxes. The net earnings after tax are:

$$80 \cdot 0.75 \cdot 10 = 600.$$

- Deferral in Capital Gains: If the same \$1,000 grows at 8% annually and the gains are taxed only upon sale after 10 years, the asset's value grows to: $FV = 1,000 \cdot (1.08)^{10} = 2,158.92$. The capital gain is: $2,158.92 - 1,000 = 1,158.92$. And you pay 25% tax on the gain when selling: $1,158.92 \cdot 0.25 = 289.73$. Since the tax is deferred, more of your money compounds over time, making the after-tax gain:

$$2,158.92 - 289.73 = 1,869.19.$$

So, the net profit of the investment would be: \$869.19.

3.2 Inflation adjustment issue

Capital gains are taxed based on the nominal increase in an asset's value, not its real (inflation-adjusted) value. For example, if an asset is bought for \$100 and sold for \$200 after 10 years, but inflation has also doubled the general price level, the real value of the asset hasn't increased. Despite this, taxes would be owed on the \$100 nominal gain, making the effective tax on capital gains higher in real terms compared to ordinary income.

For instance, you buy an asset for \$1,000 and sell it 10 years later for \$2,000. Inflation over the 10 years doubles the general price level (100% inflation). Tax rate on capital gains is 25%. The nominal gain is: $2,000 - 1,000 = 1,000$. The tax owed is: $1,000 \cdot 0.25 = 250$. So, the net profit is \$750. However, the inflation is 100% and therefore, all prices have doubled, meaning that with the gained \$750, after 10 years you can actually buy \$375 worth of goods. Let's use coffee to illustrate it. The price of coffe before inlfation was \$5 per bag and with \$750, you can buy:

$$\frac{750}{5} = 150 \text{ bags of coffee.}$$

However, after inflation (prices double), the price of coffee now is \$10 per bag, then with \$750, you can now buy:

$$\frac{750}{10} = 75 \text{ bags of coffee.}$$

3.2.1 Liberatarian Note

From a libertarian perspective, inflation acts as an implicit tax imposed by central banks, eroding the purchasing power of savings and investment returns. Unlike explicit taxes, it silently redistributes wealth by devaluing currency over time, penalizing savers and rewarding those with assets or debt. This undermines individual financial autonomy and transfers wealth to governments and financial institutions that benefit from newly created money. They benefit because newly created money reaches governments and financial institutions first (e.g., through borrowing or asset purchases) before inflation fully spreads across the economy. At this stage, they can use the money at pre-inflation prices, giving them greater purchasing power. By the time inflation spreads and prices rise, the rest of society bears the cost through reduced purchasing power, while those who received the money first have already gained. This is known as the Cantillon effect.

4 Market Bubbles

An asset bubble occurs when the price of an asset, such as real estate, rises rapidly and significantly beyond its intrinsic or fundamental value due to speculative behavior. Let's explain this using the story of the real estate crisis of 2008.

Imagine you're considering buying a house that, under normal circumstances, would be worth $\$220,000$ next year. With an interest rate of 10%, its fair present value today would be $\$200,000$. However, when people start believing that the house's price could rise to $\$240,000$ or higher, they get optimistic. This belief causes them to buy houses now, pushing up current prices. When prices rise, others take this as evidence that the market is hot and jump in too, creating a feedback loop where higher prices lead to expectations of even higher prices.

During the 2005–06 housing bubble, this exact pattern unfolded. Houses became so overvalued that the ratio of house prices to rents and house prices to median incomes far exceeded historical norms. Suppose historically, the price of a house is about 10 times the yearly rent for a similar house. For example, if rent is $\$20,000$ per year, the house's price would typically be around $\$200,000$. During the housing bubble in **2005–06**, this ratio shot up to something like 20 times the yearly rent. A house with a yearly rent of $\$20,000$ was suddenly selling for $\$400,000$. This overvaluation suggested that buyers were no longer basing prices on the actual economic fundamentals, like rental income or household affordability, but rather on speculative expectations that prices would keep rising.

These fundamentals suggested that the high prices weren't sustainable, but many buyers ignored this, believing that "this time it's different." The bubble eventually burst when prices could no longer rise, and many people were left with homes worth far less than what they paid, leading to widespread financial losses.

Banks also followed a similar path by easily granting loans, which increased demand for houses because more people could afford to buy them, even if they couldn't otherwise. This higher demand pushed house prices up further, fueling the bubble.

On the supply side, during the housing bubble, supply initially tried to keep up with demand as builders rushed to construct more homes. However, because speculative demand often outpaced real, sustainable demand, the market became oversaturated. When the bubble burst, there were too many houses and not enough buyers, leading to plummeting prices.

The lesson from asset bubbles is to focus on economic fundamentals like rental rates and income levels. When prices deviate too far from these basics, it's often a sign of an unsustainable bubble. The belief that prices will always go up, no matter what, is the key driver of bubbles—and the very thing that causes their eventual collapse.

5 Depletable Resources

The main idea is that the price of a depletable resource like oil in a competitive market must rise at the interest rate of the market over time, as oil in the ground functions like an asset. The interest rate of the market reflects the return you could earn by investing money elsewhere, such as in a bank or bond.

- When the Interest Rate is Higher than the Return on Oil: If the market interest rate is higher than the expected return on oil, oil producers will extract and sell oil immediately to fuel stations. The logic is that by selling the oil, they can invest the proceeds (ingresos) at the higher market interest rate and earn more money after a year.
  - **Impact on Supply and Price:** Since producers are selling oil immediately, supply increases in the current market, which will push the price of oil down.
  - **Impact on Demand:** Demand would not necessarily increase in this case because the lower price reflects the market clearing the excess supply. The focus is on producers shifting their behavior, not consumers suddenly increasing demand significantly.
- When the Return on Oil is Higher than the Market Interest Rate: If oil's return (through rising prices) exceeds the market interest rate, producers will choose to hold onto their oil instead of extracting and selling it now. They'll wait until next year to sell it at a higher price, earning a better return than the market interest rate.
  - **Impact on Supply and Price:** By delaying extraction, current supply decreases, which drives the price of oil up.
  - **Impact on Demand:** Higher prices might reduce demand slightly, but in this scenario, the price rise is driven by reduced supply rather than a significant change in consumer behavior.

The price level itself is determined by supply and demand. If the total supply of oil S is depleted over $T = S/D$ years (based on a constant annual demand D), the price of oil at the time of exhaustion must equal the cost C of its perfect substitute, like liquefied coal, substitute provided by the market. The initial price of oil p_0 must grow at the rate of interest r to match C after T years:

$$p_0(1+r)^T = C \quad \text{or} \quad p_0 = \frac{C}{(1+r)^T}.$$

This equation implies that any increase in supply (extending T) or a reduction in the cost of substitutes (C) will lower p_0. This model explains how **scarcity**, **substitutes**, and **financial returns** influence the price dynamics of depletable resources.

5.1 Natural Gas & Oil Prices: Iraq and Kuwait Invasion / Russian and Ukraine War

5.1.1 Iraq and Kuwait Invasion

When **Iraq invaded Kuwait in 1990**, the United Nations imposed a blockade on oil imports from Iraq, creating a sudden shock to the global oil supply. This led to an immediate increase in oil prices on the world market. In the U.S., the price of gasoline also rose quickly at the pumps, sparking accusations of "war profiteering" against oil companies.

Critics argued that oil companies were unjustly raising gasoline prices, even though the gasoline at that moment had been produced using oil purchased at lower, pre-crisis prices. Critics, in particular claimed that the higher gasoline prices were unjustified because:

1. The oil companies were selling gasoline that had been refined from cheaper oil purchased before the crisis.
2. The effects of the higher oil prices would not materialize until at least 6 weeks later, when newly purchased, higher-priced oil would have been refined and made its way to gas stations.

Thus, they believed oil companies were exploiting the situation to make "excessive profits" by immediately raising gasoline prices without justification.

What Economists or Supporters of Market Pricing argued that the price of gasoline reflects its replacement cost, not the historical cost. Even if the current gasoline was produced with cheaper oil, oil companies would soon need to purchase oil at higher prices. Immediate price increased due to:

- Signal the reality of the supply shock.
- Discourage over-consumption by reflecting the higher opportunity cost of oil.

Let's explain it easily. If you own gasoline in a storage tank and know it will be worth $1.50 a gallon in six weeks, it wouldn't make sense to sell it now for just $1 a gallon. Instead, you'd hold onto it and wait to sell at the higher price. This is called intertemporal arbitrage — choosing to sell at the time when you can get the best return. To encourage you to sell today, the current price must reflect the expected future price, adjusted for the time value of money.

This logic applies to oil companies during a supply shock: when they expect future prices to rise, they hold back oil or gasoline now, reducing supply in the present. This pushes the current price up to match the anticipated future price, signaling that gasoline is becoming more scarce. From a welfare perspective, higher prices make sense because they encourage conservation (people use less gasoline now, knowing it's going to be scarcer and more expensive later).

A similar situation occurred in Russia during its economic transition. Russian oil was priced at $3 a barrel, far below the global price of $19 a barrel. Knowing prices would soon rise, Russian oil producers held back supply, waiting to sell at the higher price later. This created immediate shortages, with long lines at gas stations. As one producer pointed out, it would be foolish to sell something worth $19 for just $3, just like you wouldn't sell $1 for 10 cents.

5.1.2 Russia and Ukraine War

The previous example of intertemporal arbitrage ties directly to what happened with **Russian natural gas and oil during the war in Ukraine in 2022**. Let's recall the situation:

- **Dependence on Russian Energy:** Before the war, Europe relied heavily on Russian natural gas and oil for energy. Russia was a major supplier, providing nearly 40% of Europe's gas and significant amounts of oil. When the war began, sanctions were imposed on Russian energy exports, creating uncertainty and fears of supply disruptions.
- **Intertemporal Arbitrage:** Oil and gas producers, including Russia, responded with intertemporal arbitrage-like behavior:
  - Knowing that sanctions or embargoes could limit future production or exports, producers reduced current supply, either withholding resources or redirecting them to more favorable markets like China and India.
  - This immediate reduction in global supply drove prices up sharply, reflecting not just current scarcity but also expectations of ongoing future constraints.
- **Price Dynamics:** The increase in oil and gas prices wasn't solely due to sanctions. It was also driven by:
  - **Market expectations:** Fears of future shortages led to higher prices as buyers scrambled to secure supplies while they could.
  - **Diversification efforts:** European countries began reducing their reliance on Russian energy, creating competition for alternative sources (e.g., liquefied natural gas from the U.S. or Qatar). This increased demand in non-Russian markets, pushing prices higher globally.

Just like in the earlier example of holding back gasoline, Russian producers and global markets adjusted supply today based on future expectations. Russian oil and gas producers knew their access to European markets would shrink due to sanctions. Instead of flooding the market with supply, they redirected energy exports and/or withheld supply, betting on higher future prices in alternative markets or favorable terms with new trading partners. Europe, in turn, scrambled to build up reserves and secure future supply contracts, which raised prices even more, as buyers were effectively competing for finite resources.

Was the Price Increase Solely Due to Sanctions? Not entirely. Sanctions were a significant factor, but other forces amplified the price increase:

- **Fear of future scarcity:** Market participants anticipated tighter supplies due to sanctions, driving up prices as they bought in advance.
- **Energy market dynamics:** Europe's rush to replace Russian energy created a bidding war for alternative sources, which further inflated prices.
- **Global disruption:** The war and sanctions disrupted supply chains, increasing costs across industries, including shipping, refining, and transportation.