Arbitrage: it isn’t an often-heard word when discussing the economy. In fact, I consulted the indices of 6 textbooks in economics, covering micro or macro or both, and ranging from mostly qualitative to strongly mathematical and found not a single entry; but its importance to markets can be hardly overstated. In order to understand why this is, we need to first think a little about how markets work and the role of information in the marketplace.

A key observation is that markets work most efficiently when they are at a natural equilibrium and their approach to equilibrium or even the equilibrium they assume can be impeded by insufficient information about the goods and services being sold.

For example, in Chapter 18 of his book *Principles of Economics: Economics and the Economy Version 2.0*, Timothy Taylor discusses how imperfect information can impeded economic participation in each of the markets for goods and services, labor, and finance. A person seeking to buy a used car is naturally wary about the quality of the car about which they know very little and the seller knows far more. An employer looking to hire a new employee is also naturally wary about the quality of the employee because all that he can discern is comes from a resume and an interview. (As a side note, this is why the coding interview, in which prospective computer programmers are given real problems to solve, exists as a hiring gate.) Finally, a person seeking a loan from a bank has to contend with the bank’s inherent skepticism about the soundness of the repayment prospects even if the person has an impeccable character where borrowing money is concerned.

These reluctances serve to slow down economic participation, push the equilibrium away from where it would sit in a market with perfect knowledge and can lead to unintuitive situations where raising prices can actually raise demand rather than the other way around (that, however, is a post for another day). Collectively, economists term all these ‘non-ideal’ market behaviors as inefficiencies.

Markets have developed lots of different ways of dealing with inefficiencies and the risks that follow. Some of the more well-known ones are guarantees, certifications, and insurance and premiums. Interest rates on loans are structured to provide the lender some insurance against the default of the loan as seen in the usual formula:

<Interest Rate = Risk Premium + Expected rate of inflation + time value of money.>

The mechanism of arbitrage is also a powerful way for the markets to deal with inefficiencies, it just isn’t as broadly familiar.

In a nutshell, arbitrage is the purchase and subsequent sell of some good (typically called an asset) in order to profit from a positive difference between the final market’s price and the asset’s price in the original market.

For example, suppose the

Arbitrage

In the classical theory, the asset can be purchased and sold simultaneously thereby producing a profit at zero risk. This idealization is never met in actual trading situations although cer

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Arbitrage Pricing Theory (APT) – Adam Hayes

<https://www.investopedia.com/terms/a/apt.asp#:~:text=Updated%20Jun%2025%2C%202019.%20Arbitrage%20pricing%20theory%20%28APT%29,number%20of%20macroeconomic%20variables%20that%20capture%20systematic%20risk>.

* Arbitrage pricing theory (1976 by American economist, Stephen Ross)
  + Multi-factor asset pricing model
  + Basic idea – an asset’s returns can be predicted using a linear relationship between the asset’s expected return and a number of macroeconomic variables
  + The macroeconomic variables capture or define the systemic risk
  + <R>\_i = <R>\_z + \beta \* (<I> - <R>\_z)
    - <R>\_i – asset’s expected rate of return
    - <R>\_z – risk free rate of return
    - <I> - Risk premium associated with factor i
    - \beta – sensitivity of the asset price to macroeconomic factor n
    - Messed up model – both in concept and embodiment from this website
  + This model is an alternative to the capital asset pricing model (CAPM)
  + CAPM assumes markets are perfectly efficient and only accounts for market risk; APT assumes that markets can and do misprice and accounts for multiple risk/error sources
  + This model is not risk free arbitrage “because investors are assuming that the model is correct and making directional trades- rather than locking in risk-free profits”
  + APT factors are systemic risk that cannot be reduced by diversification
  + APT factors most commonly used
    - GNP
    - Unexpected changes in inflation
    - Corporate bond spread
    - Shifts in the yield curve
    - GDP (lesser)
    - Commodities prices (lesser)
    - Market indices (lesser)
    - Exchange rates (lesser)
  + Example of How Arbitrage Pricing Theory Is Used
    - For example, the following four factors have been identified as explaining a stock's return and its sensitivity to each factor and the risk premium associated with each factor have been calculated:
      * Gross domestic product (GDP) growth: ß = 0.6, RP = 4%
      * Inflation rate: ß = 0.8, RP = 2%
      * Gold prices: ß = -0.7, RP = 5%
      * Standard and Poor's 500 index return: ß = 1.3, RP = 9%
      * The risk-free rate is 3%
    - Using the APT formula, the expected return is calculated as: Expected return = 3% + (0.6 x 4%) + (0.8 x 2%) + (-0.7 x 5%) + (1.3 x 9%) = 15.2%

<https://corporatefinanceinstitute.com/resources/knowledge/finance/arbitrage-pricing-theory-apt/>

* APT aims to pinpoint the fair market price of a security that may be temporarily incorrectly priced
* the APT’s concept of arbitrage is different from the classic meaning of the term; In the APT, arbitrage is not a risk-free operation – but it does offer a high probability of success
* Historical returns on securities are analyzed with linear regression analysis against the macroeconomic factor to estimate beta coefficients for the arbitrage pricing theory formula.
* Example
  + Assume that: You want to apply the arbitrage pricing theory formula for a well-diversified portfolio of equities.
    - The riskless rate of return is 2%.
    - Two similar assets/indices are the S&P 500 and the Dow Jones Industrial Average (DJIA).
    - Two factors are inflation and gross domestic product (GDP).
    - The betas of inflation and GDP on the S&P 500 are 0.5 and 3.3, respectively\*.
    - The betas of inflation and GDP on the DJIA are 1 and 4.5, respectively\*.
    - The S&P 500 expected return is 10%, and the DJIA expected return is 8%\*.

Arbitrage Pricing Theory: It’s Not Just Fancy Math Elvin Mirzayev

<https://www.investopedia.com/articles/active-trading/082415/arbitrage-pricing-theory-its-not-just-fancy-math.asp>

* Inherent to the arbitrage pricing theory is the belief that mispriced securities can represent short-term, risk-free profit opportunities.
* The theory does, however, follow three underlying assumptions:
  + Asset returns are explained by systematic factors.
  + Investors can build a portfolio of assets where specific risk is eliminated through diversification.
  + No arbitrage opportunity exists among well-diversified portfolios. If any arbitrage opportunities do exist, they will be exploited away by investors. (This how the theory got its name.)
* Changes parameters include
  + Changes in inflation
  + Industrial production
  + Risk premiums
  + Interest rates
* Factor sensitivities come from multi-variate regression
* Example – S&P 500 and NASDAQ with 2% risk-free return each and expected return of 7 and 9 respectively

Nice Video

<iframe width="560" height="315" src="https://www.youtube.com/embed/ntKlSsSlumU" frameborder="0" allow="accelerometer; autoplay; encrypted-media; gyroscope; picture-in-picture" allowfullscreen></iframe>

Arbitrage Betting: <https://www.youtube.com/watch?v=TGinzvSDayU>

Retail Arbitrage: <https://www.youtube.com/watch?v=T-u0W7n324Q>