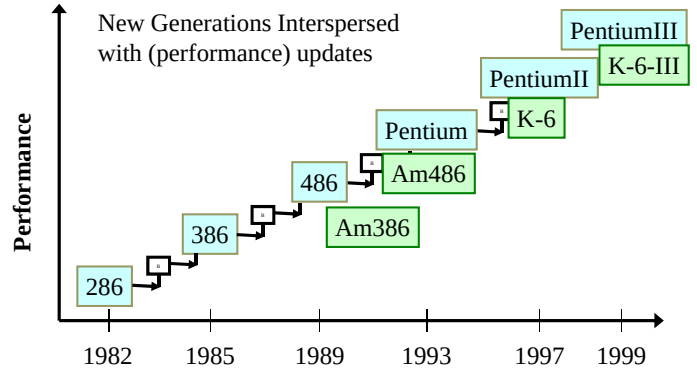
1c – Intel Preview: Intel and the Learning Curve

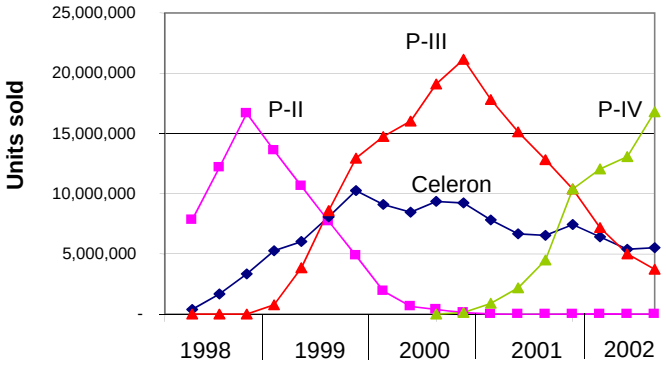
A virtuous cycle created by exponentially fast learning.

Intel's stock price since IPO

Intel: Historically a step ahead



Generational Updates



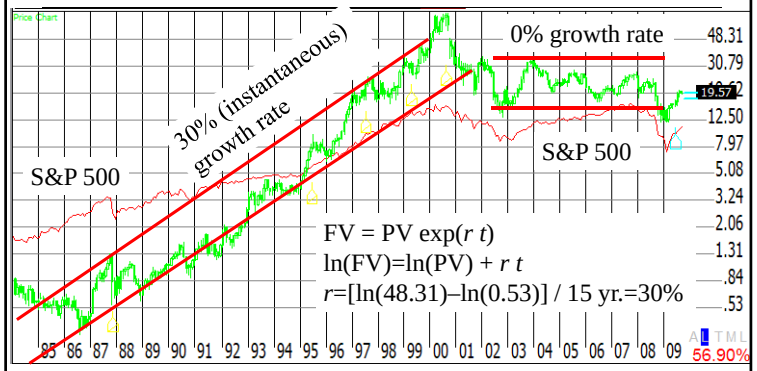
Intel & The Learning Curve

- Assess what drives Intel's growth
- Assess risks faced by Intel
- Show how the ***Learning Curve*** compares for automobiles and transistors.
- Understand what *exponentially fast learning* is
- Show how process innovation leads to Intel's virtuous cycle

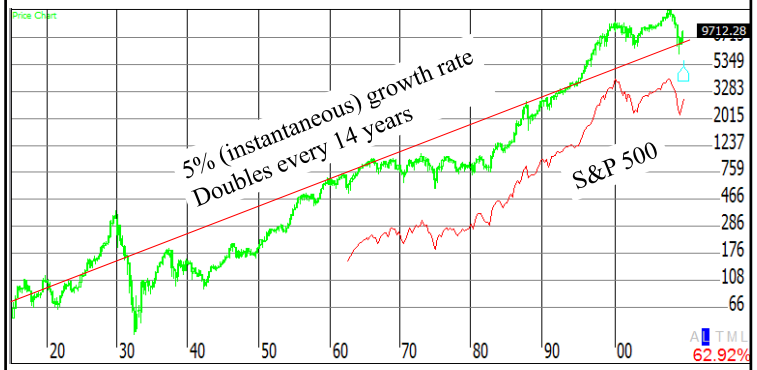
Exponential Growth

- **What is exponential growth?**
- **What are some examples of exponential growth?**
  - **Rule of 72**
    - **Take 72 and divide it by interest rate to get # of years it takes to double.**
  - **For continuous compounding:**
    - **Take 69.2 and divide it by the instantaneous "interest rate" to get # of years it takes to double.**

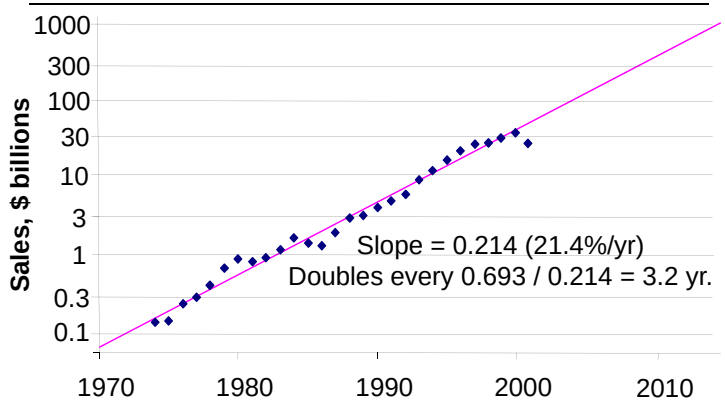
Intel's stock price



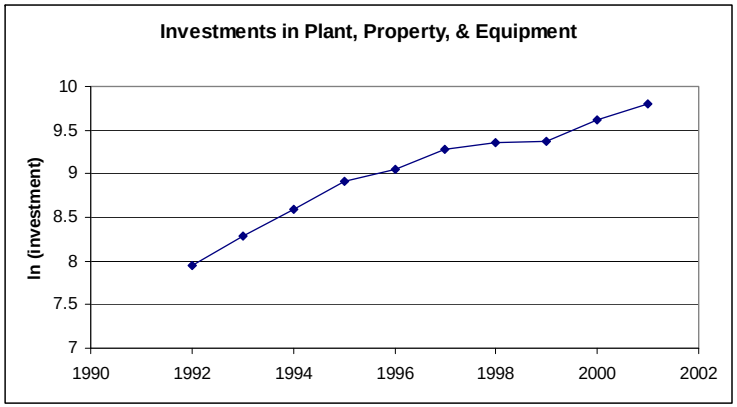
Dow: Exponential growth



Intel: Exponential growth in sales
$1 trillion in sales by 2015 ?



Exponential Growth in PPE



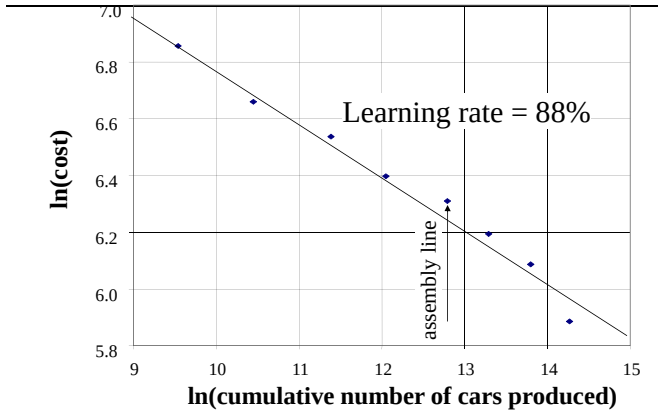
Learning

- **What if you wanted a better GMAT score?**
- **Who is the more experienced test taker?**
  - **Someone who has been taking GMAT tests for 10 years?**
  - **Someone who has been taking GMAT tests for 1 year?**
- **Which is the more mature product?**
  - **Automobiles, invented around 1900**
  - **Transistors (electronics), invented around 1950**

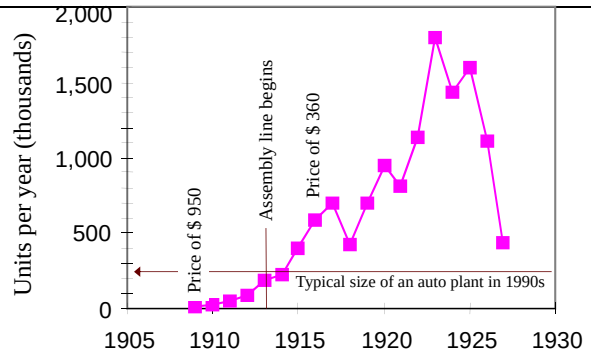
Learning Curves

- Based on empirical observation.
- Cost reduction takes place in a predictable manner.
- After cumulative production volume doubles, the end cost will be some fraction of the earlier cost.
- This fraction (or %) is known as the "learning rate."
- Learning rates of 70% to 90% are typical.
- Based on the learning rate of 88% for Ford's Model T:
  - 1st car "cost" $5,600
  - 2nd car "cost" $5,600 (0.88) = $4,900
  - 4th car "cost" $4,900 (0.88) = $4,300
  - 8th car "cost" $4,300 (0.88) = $3,800

Learning curve for Ford's Model T, 1909-1916



Ford Model T Production, 1908-27



Hounshell, '84