

CHAPTER 1.

INTRODUCTION AND CONTEXT

SOLUTIONS

by

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Figure E.1

a. This figure shows the time series of the median household income measure in 2006 dollars. Median income is defined as the level of income above (below) which 50% of the households enjoy higher (lower) income. The frequency of the data is annual, and the five series exhibit a mild upward trend.

b. The Census Bureau defines household as “A family household is a household maintained by a householder who is in a family (as defined above), and includes any unrelated people (unrelated subfamily members and/or secondary individuals) who may be residing there. The number of family households is equal to the number of families. The count of family household members differs from the count of family members, however, in that the family household members include all people living in the household, whereas family members include only the householder and his/her relatives. See the definition of family.”

<http://www.census.gov/population/www/cps/cpsdef.html>

c. Real dollars account for the effect of inflation whether nominal dollars do not. Figure E.1 presents the data in real dollars (with base in 2006), so that real income (purchasing power) can be comparable across different periods of time. For instance, \$100 dollars in 1979 in real terms will buy the same basket of goods as \$100 in 2003.

d. The upward trend may be explained by increases in productivity, increasing returns to human capital, better nutrition, etc.

Figure E.2

a. This figure shows the time series of the saving rate in percentage terms. The frequency is monthly and the time series exhibit a downward trend, which is steeper from 1994 onwards. The saving rate is defined as the proportion of disposable income that is not consumed.

b. A negative saving rate means that people consume above their disposable incomes. In Figure E.2 the rate becomes negative in 2005, and from that time to 2008 is very close to 0.

c. The downward trend may be explained by stagnant household incomes jointly with high levels of debt, which finances current consumption.

Figure E.3

a. This figure shows the time series of inflation. The frequency is monthly and it is measured as the 12-month percentage change in the level of consumer prices. There seems to be a mild downward trend in the series “All items less food and energy”. The inflation rate measures the changes in prices from one period to the next.

- b. To compute the 12-month percentage change compare the price today and the price 12-months ago, and calculate the percentage change as $100 \times (P_t - P_{t-12})/P_{t-12}$.
- c. The prices of food and energy tend to be more volatile in the short run than those of other items. Food and energy are exposed to unpredictable shocks such as weather conditions, political conflicts, etc.
- d. The time series of inflation including food and energy exhibit more fluctuations and it may be dominated by the volatility of food and energy. We measure inflation excluding food and energy to detect the long run trend of prices.
- e. For additional information about inflation rates (consumer prices) across several countries in the world, see the website <http://www.indexmundi.com/g/r.aspx?v=71>.

Figure E.4

- a. This figure shows the time series of the Case-Shiller house price index. The frequency is monthly and it is measured as the 12-month percentage change in the level of the price index. The Case-Shiller price index tracks the prices of the U.S. residential real estate nationally in the 10 and 20 largest cities in the country.
- b. The period from 1996 to 2006 is considered a “housing market bubble” because the prices were increasing at extravagant rates well above the historical growth rates.
- c. The U.S. economy was highly invested in real estate fueled by deregulation of financial markets and, in particular, by the lack of regulation of the derivatives market and lack of oversight in lending practices. Houses were commoditized, and there was a national illusion that prices cannot fall down, which created a cycle of high demand, high prices, and high level of household debt. When prices started falling, the level of debt became unsustainable, initiating a wave of defaults, home foreclosures and lower home prices, reversing the upward trend quiet abruptly.

Figure E.5

- a. This figure shows the time series of the Dow Jones Industrial Average (DJI) Index. The frequency is monthly. There is an upward trend. The DJI index is a price-weighted measure of the stock prices of 30 U.S. “blue-chip” companies. It is an indicator of the state of the financial markets in U.S.A. For more information visit the website <http://www.djaverages.com/>.
- b. The index on Jan. 4, 1988 was 2,032 and on April 29, 2008 was 12,820. The total return over this period is $100 \times (12,820 - 2,032)/2,032 = 530.90\%$.
- c. The trend indicates that the companies in the index have enjoyed a solid growth in their businesses.
- d. Most of the developed economies in the world experienced a similar trend over the same period in the stock indexes. See <http://www.world-stock-exchanges.net/indices.html>

Figure E.6

- a. This figure shows the time series of the exchange rate U.S. \$/euro. The frequency is monthly. There seems to be a mild trend in the series. An exchange rate provides the monetary equivalence between two countries currencies. If U.S. \$/euro is 1.5, it means that 1 euro is equivalent or will buy 1.5 U.S. \$. We can also say that 1 U.S. \$ will buy 0.666 euros.
- b. and c. The euro appreciates when it buys more dollars, and it depreciates when it buys fewer dollars. In Figure E.6, the euro appreciated from 2002 to 2008, which is equivalent to say that the U.S. \$ depreciated.

Figure E.7

a. This figure shows the time series of the exchange rate yen/\$. The frequency is monthly and there is not an obvious trend but there is some persistence in the series. If yen/\$ is 120, it means that \$1 buys 120 Yens.

b. and c. The yen appreciates when the U.S. \$ buys fewer yens. In Figure E.7, the yen appreciated roughly from 1990 to 1995, from 1998 to 2000, and from 2002 to 2004. Consequently, the U.S. \$ depreciated in the same dates.

d. It will be possible to construct the exchange rate yen/euro with both time series \$/euro and yen/\$. If we multiply both series, we have that

$$\frac{\$}{euro} \times \frac{yen}{\$} = \frac{yen}{euro}$$

to obtain the exchange rate yen/euro.

Figure E.8

a. This figure shows the time series of the 30-year fixed loan mortgage rate. The frequency is monthly and there is a downward trend in the series. A mortgage rate is the interest rate of a loan on real estate. It is the price paid by borrowing money against a house, condo, commercial property, or any other type of real estate.

b. We expect the 30-year rate to be higher than the 15-year rate because the longer the maturity, the riskier is the loan for the lender.

c. Economic factors that affect mortgage rates are the money supply, economic activity, construction activity, liquidity, foreign investments, etc.

d. Monetary policy is very important to determine mortgage rates. The Federal Reserve influences interest rates by open market operations, that is, selling or buying short and long term securities. When the Fed sells securities, the money supply is reduced as the Fed exchanges securities for money. When the Fed buys securities, the money supply increases as the Fed exchanges money for securities.

Figure E.9

This figure shows the time series of the short-term rate (3-month T-Bill) and the long-term rate (10-year T-Bond). The frequency is monthly and there seems to be a mild downward trend amid cycles of high persistence.

Figure E.10

a. This figure shows the time series of the spread, defined as the difference between the long and short term rates. The frequency is monthly, and there is no trend but very persistent cycles. A Treasury Bill is a fixed income short term security issued by the U.S. government with maturity less than a year.

b. The long term rate could be above or below the short term rate. For most of the period considered in Figure E.10, the spread was positive. Long term securities are riskier than short term securities, thus we expect the long term rate to be larger than the short term rate. However, there are instances in which the spread is negative. This is called an inverted yield curve, which seems to be a leading indicator of recessions.

c. The yield curve is the collection of interest rates corresponding to securities with different

maturities, from 1 month up to 30 years. For more information, see <http://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield>

d. In Figure E.10, the largest spread corresponds to the years 1992-1994 and 2002-2004. Investors were anticipating a rise in the risk-free interest rate because the economy was in an expansionary phase. They were demanding higher rates in order to lock their money now in anticipation of future increases.

Figure E.11

a. This figure shows the time series of the birth rate, mortality rate, and life expectancy in US. The frequency is yearly with a downward trend in the infant mortality rate and an upward trend in the life expectancy time series. Birth rate is the number of live births per 1000 people per year. Infant mortality rate is the number of deaths of children less than 1 year old per 1000 live births.

b. Life expectancy is the expected number of years of life remaining at a given age.

c. and d. A common factor to explain high life expectancy and low infant mortality rate is economic growth which is correlated with innovation and major advances in the medical sciences, and better education in the population at large. Birth rates tend to be lower in developed countries than in developing and underdeveloped countries.

Figure E.12

a. This figure shows the time series of the mathematics scores at different ages. The frequency is yearly. The scores measure knowledge of mathematics on five broadly defined areas: numerical operations, geometry, measurements, statistics, and algebra, for students from elementary school to high school.

b. There is a very mild trend in the time series Age 9 and Age 13 but none in the series Age 17.