Math 34: Fall 2015
Section 7.3 (Mutual Funds and Investment Portfolios)

• Stock Prices (rounded to the nearest dollar) from Oct 2014-Oct 2015

<table>
<thead>
<tr>
<th></th>
<th>WBMD *</th>
<th>WDFC *</th>
<th>WEN *</th>
<th>WFM *</th>
<th>WHR †</th>
<th>WMT †</th>
<th>WU †</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WebMD</td>
<td>WD-40</td>
<td>Wendy’s</td>
<td>Whole</td>
<td>Foods</td>
<td>Whirlpool</td>
<td>Walmart</td>
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<tr>
<td>Oct ’14</td>
<td>37</td>
<td>68</td>
<td>8</td>
<td>37</td>
<td>146</td>
<td>74</td>
<td>16</td>
</tr>
<tr>
<td>Dec ’14</td>
<td>37</td>
<td>76</td>
<td>9</td>
<td>49</td>
<td>183</td>
<td>84</td>
<td>17</td>
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<tr>
<td>Feb ’15</td>
<td>39</td>
<td>83</td>
<td>11</td>
<td>56</td>
<td>213</td>
<td>86</td>
<td>19</td>
</tr>
<tr>
<td>Apr ’15</td>
<td>47</td>
<td>84</td>
<td>11</td>
<td>50</td>
<td>195</td>
<td>80</td>
<td>21</td>
</tr>
<tr>
<td>Jun ’15</td>
<td>46</td>
<td>84</td>
<td>11</td>
<td>40</td>
<td>184</td>
<td>72</td>
<td>21</td>
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<tr>
<td>Aug ’15</td>
<td>43</td>
<td>89</td>
<td>10</td>
<td>33</td>
<td>175</td>
<td>72</td>
<td>20</td>
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<tr>
<td>Oct ’15</td>
<td>44</td>
<td>93</td>
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<td>34</td>
<td>155</td>
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(prices taken as close to the 15th of the month as possible)

* denotes NASDAQ, † denotes NYSE

• Q: Which 2 Stock would you have been best off investing in in October 2014? why?

• Q: Which 2 Stock would you have been worst off investing in in October 2014? why?
• Compound Annual Growth Rate is the easy/fair way to compare different stocks

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<td>34</td>
<td>155</td>
<td>59</td>
<td>19</td>
</tr>
<tr>
<td>CAGR</td>
<td>18.92%</td>
<td>36.76%</td>
<td>12.5%</td>
<td>−8.11%</td>
<td>6.16%</td>
<td>−20.27%</td>
<td>18.75%</td>
</tr>
</tbody>
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• Another Way to Compare

What if you have invested $1000 in each stock in Oct 2014?

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<td>Western Union</td>
</tr>
<tr>
<td># shares</td>
<td>27.020</td>
<td>14.706</td>
<td>125.000</td>
<td>27.027</td>
<td>6.849</td>
<td>13.513</td>
<td>62.500</td>
</tr>
<tr>
<td>SP Oct ’14</td>
<td>37</td>
<td>68</td>
<td>8</td>
<td>37</td>
<td>146</td>
<td>74</td>
<td>16</td>
</tr>
<tr>
<td>IV Oct 14</td>
<td>$1000</td>
<td>$1000</td>
<td>$1000</td>
<td>$1000</td>
<td>$999.95</td>
<td>$999.96</td>
<td>$1000</td>
</tr>
<tr>
<td>SP Oct ’15</td>
<td>$1189.19</td>
<td>$1367.66</td>
<td>$1125</td>
<td>$918.92</td>
<td>$1061.60</td>
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<td>$1187.5</td>
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SP = Stock Price
IV= Investment Value

• What if you and 7 friends decide to each put in $1000, and pool your money in Oct 2014, and spent the $7000 buying $1000 of each stock, and then splitting the profits.

  − In Oct 2014 you spent
    1000 + 1000 + 1000 + 1000 + 999.95 + 999.96 + 1000 = $6999.91
  − (Oct 2015) Your investments are now worth:
    11189.19 + 1367.66 + 1125 + 918.92 + 1061.60 + 797.27 + 1187.5 = $7647.14
  − What Compound Annual Growth Rate does this represent?

  − How does that CARG compare to the CARG’s of the individual stocks?
• This is the idea behind an **Investment Portfolio**:  
  *a mix of investments in different securities (specific investments)*

• **Pro’s and Con’s of Diversification**

• **Asset Classes**
  
  – *Equities*: investments that represent ownership in a business (stocks)
  
  – *Fixed Income*: investments that provide a steady stream of payments (bonds, longterm CD’s, mortgages, etc)
  
  – *Cash*: short term investments with little or no risk (bank accounts, short term corporate bonds from companies with very solid credit ratings, etc)

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Degree of Risk</th>
<th>Historical Avg. Rate of Return</th>
</tr>
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<tr>
<td>Cash</td>
<td>Minimal</td>
<td>2 – 5%</td>
</tr>
<tr>
<td>Fixed Income</td>
<td>Moderate</td>
<td>4 – 7%</td>
</tr>
<tr>
<td>Equities</td>
<td>High</td>
<td>8 – 12%</td>
</tr>
</tbody>
</table>

• These are LONG TERM AVERAGES of how these investments have done in the past.
  
  – They will do differently in the short run.
  
  – No one can predict the future, not even math.

• **Asset Allocation:** Investors need to balance their desired return with their risk tolerance.
• Mutual Funds
  – Mutual Fund an investment portfolio that pools money from many different investors
    * Decisions are made by the portfolio manager.
    * Each invested owns a piece of the overall portfolio.

  – Net Asset Value (NAV) The total value of a mutual fund’s assets divided by the number of shares outstanding.
    (Value each share is worth)

  – Open-End mutual fund doesn’t have a fixed number of shares. New shares are created whenever someone invests (and old shares ‘vanish’ when someone takes their money out).
    Shares are bought (and sold) for NAV.

  – Closed-End funds have a fixed number of shares. They are bought and sold (like stocks), and they sell for whatever the market will bare (above or below NAV).

• Expenses
  – Mutual funds need to make money (as a company) and pay the people running the fund (along with other expenses)

  – Usually, these funds are deducted from overall assets (so NAV is a little lower than it would be if no one needed to be paid for doing their job).

  – expense ratio of a fund indicates the amount of fees charged as a percent of overall fund assets.

  – load Some funds charge load, a fee that is paid when when the fund is purchased. They are usually a percent of the total invested in the fund.
• Types of Mutual Funds
  – Almost everything imaginable
  – *Index Funds* are managed to match performance of some market index (like the Dow Jones)
  – *Balanced Funds* (asset allocation funds) invest in a mix of asset classes.

• Measuring Fund Performance
  – We use Rate of Return (CARG) to tell us how the Fund did if we think of its growth as generating a (compound) annual interest rate.
  – We’ll find what that rate is.
    * This lets us compare stocks, bonds, mutual funds, savings accounts, etc.
    * In each case we find Rate of Return (Compound Annual Growth Rate) so we know ‘what does this growth (or loss) look like as a compound annual interest rate’

\[
i = \left( \frac{FV}{PV} \right)^{(1/n)} - 1
\]

* FV = future value (end value) of the investment (take into account all shares)
* PV = present value (start value) of the investment (take into account all shares)
* n = number of YEARS the investment went for
1. Based on how long till her retirement and how comfortable she is with risk, Serifima plans to allocate money in her retirement account 55% to equities, 40% to fixed income and 5% to cash.

(a) If she assumes that each asset class performs at the low end of the historical averages for rates of return, what overall rate can she expect to earn?

(b) If she assumes that each asset class performs at the low end of the historical averages for rates of return, what overall rate can she expect to earn?

(c) What can we say for sure about the rate she will earn?

2. TIAA-CREF has a retirement class mutual fund that they call TIQRX. If the fund’s net assets total about 8.7 billion dollars (8,700,000,000), if they have about 550,000,000 shares what is the fund’s NAV?


3. Assuming TIAA-CREF’s TIQRX fund is open ended, if Serifima invests $1650, how many new shares will be created?

4. If Miles plans to invest $5000 in XYZ mutual fund, that has a NAV of $48.52, and the fund charges a 5% load, how many shares will he get?

5. In November of 2006 a mutual fund had a NAV of $132.84. In November 2014 (8 years later) the NAV was $128.43. The fund reinvested dividends, so 1 share in November 2006 has grown to be worth 1.893 shares in Nov. 2014. Calculate the average annual rate of return on this investment.

6. (optional) You’re considering investing in two mutual funds:

- Fidelity has a Real Estate Equity Fund (FREDX). Today (March 30, 2015) the NAV is $15.01. Three years ago, the NAV was about $12.90.
- Fidelity also has a stock index fund (Fidelity Nasdaq Composite Index Fund (FNCMX)). Today (March 30, 2015), the NAV is $64.65, one year ago the NAV was about $56.20.

Find the CARG for each investment and compare. Are there any other factors you should consider when deciding which fund to invest in.