INVESTMENTS II:
LESSONS & APPLICATIONS FOR INVESTORS

SCOTT WEISBENNER

Fundamentals & Composition of Returns

Basics of Return and Risk

REVIEW: BASICS OF RETURN & RISK

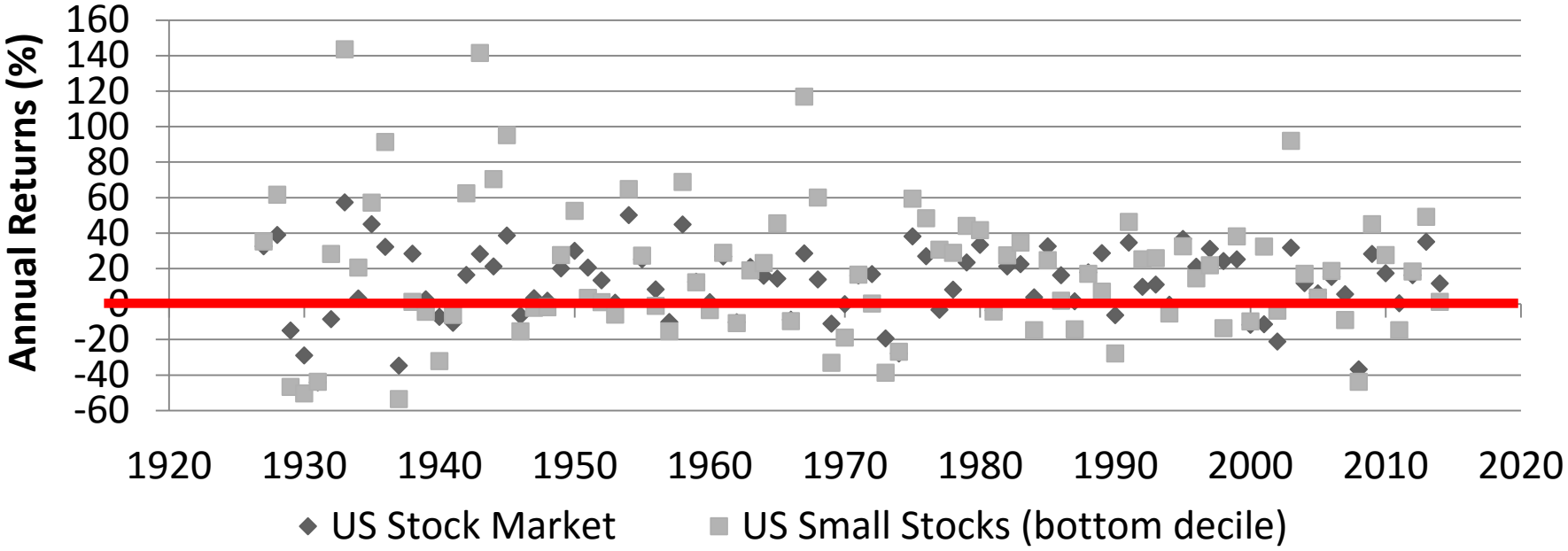
A very brief recap of Module 1 from my first Investments course on Coursera!

ANNUAL RETURNS (1927-2014)

	Arithmetic Average	Standard Deviation
U.S. Treasury Bills (1 month)	3.5%	3.1%
U.S. Treasury Bonds (10 year)	5.3%	7.8%
U.S. Stock Market (value-weighted)	11.9%	20.4%
Small U.S. Stocks (bottom decile)	19.0%	39.4%

Source: Data retrieved from Kenneth R. French Data Library (accessed 2015) & Aswath Damodaran Online Data (accessed 2015)

1927-2014: OVERALL STOCK MARKET VS. SMALL STOCKS



Source: Data retrieved from Kenneth R. French Data Library (accessed 2015)

PORTFOLIO OF RISKY ASSET AND RISK-FREE ASSET: ASSUMPTIONS

LARGE Stocks

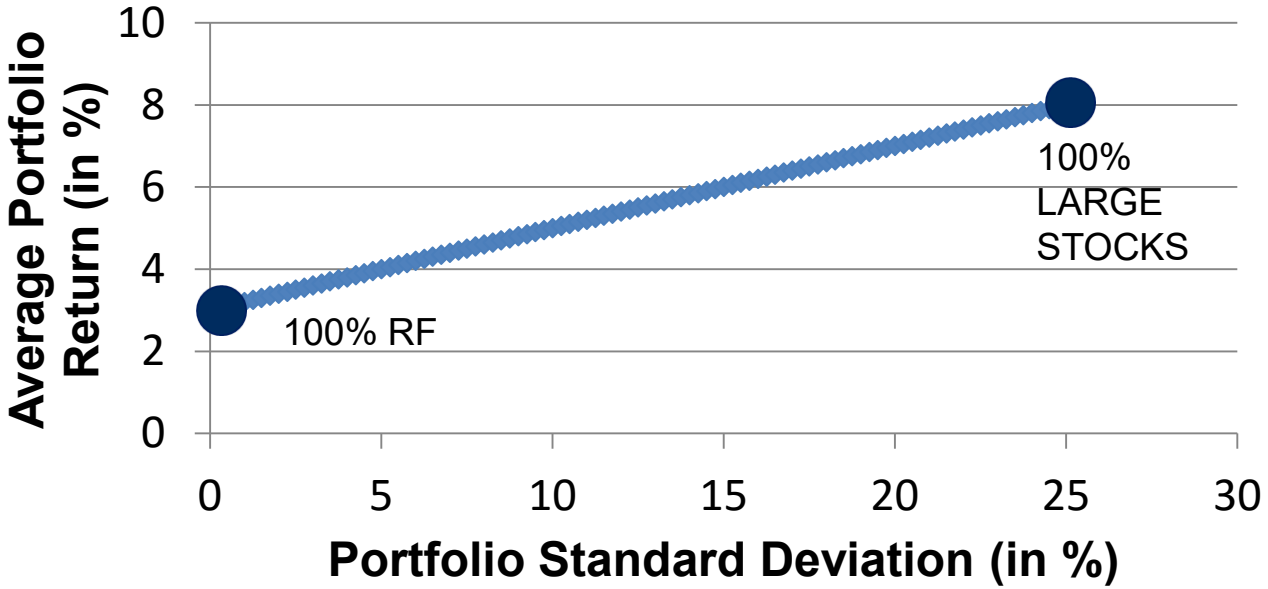
- Mean Return: 8%
- Standard Deviation: 25%

Treasury Bills (Risk-Free Asset)

- Mean Return: 3%
- Standard Deviation: 0%

Zero correlation between the two

CAPITAL ALLOCATION LINE (ASSUME NO BORROWING)



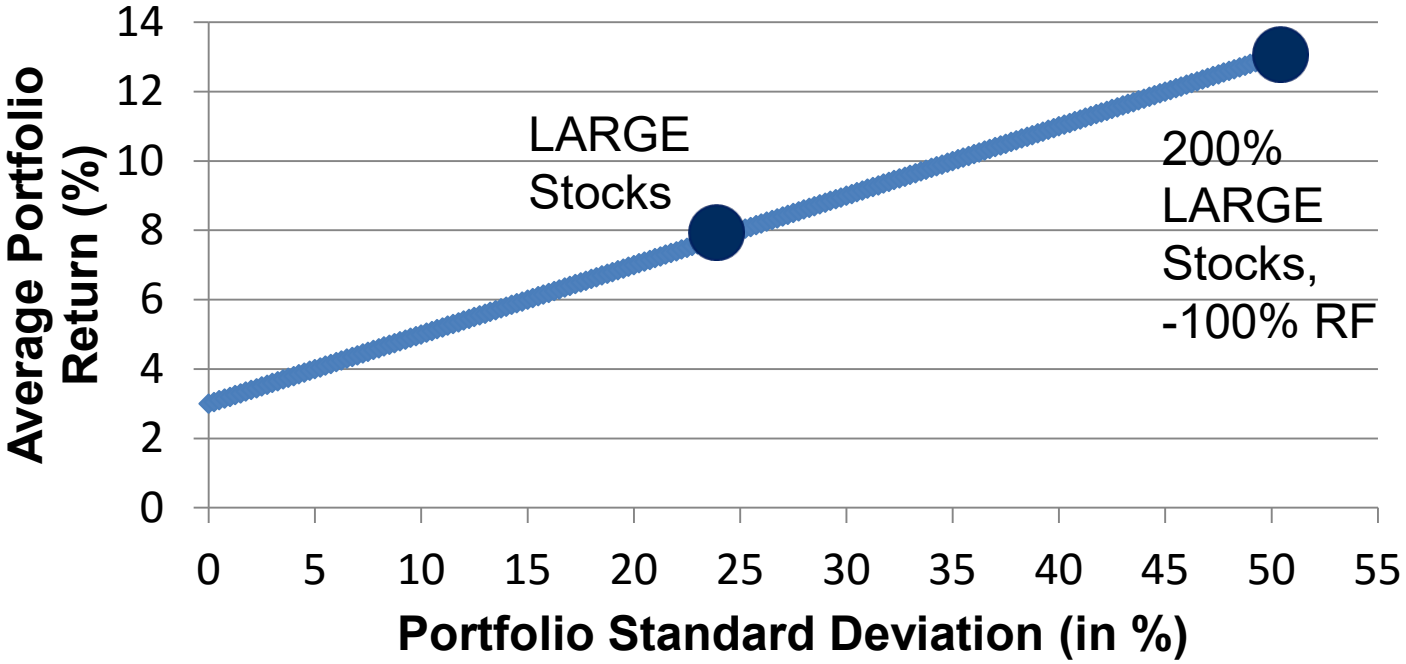
Slope represents a reward-to-volatility ratio: "***Sharpe Ratio***"

SHARPE RATIO

The average excess return of an asset (in excess of the risk-free rate) divided by the standard deviation of the asset's returns is a reward-to-volatility or Sharpe Ratio:

$$\text{Sharpe Ratio}_i = \frac{E[r_i] - r_f}{\sigma_i}$$

CAPITAL ALLOCATION LINE (WITH BORROWING!)



Borrowing at a 3% rate can achieve higher possible returns
But also leads to higher variability in returns

PORTFOLIO OF TWO RISKY ASSETS: ASSUMPTIONS

Large Stocks

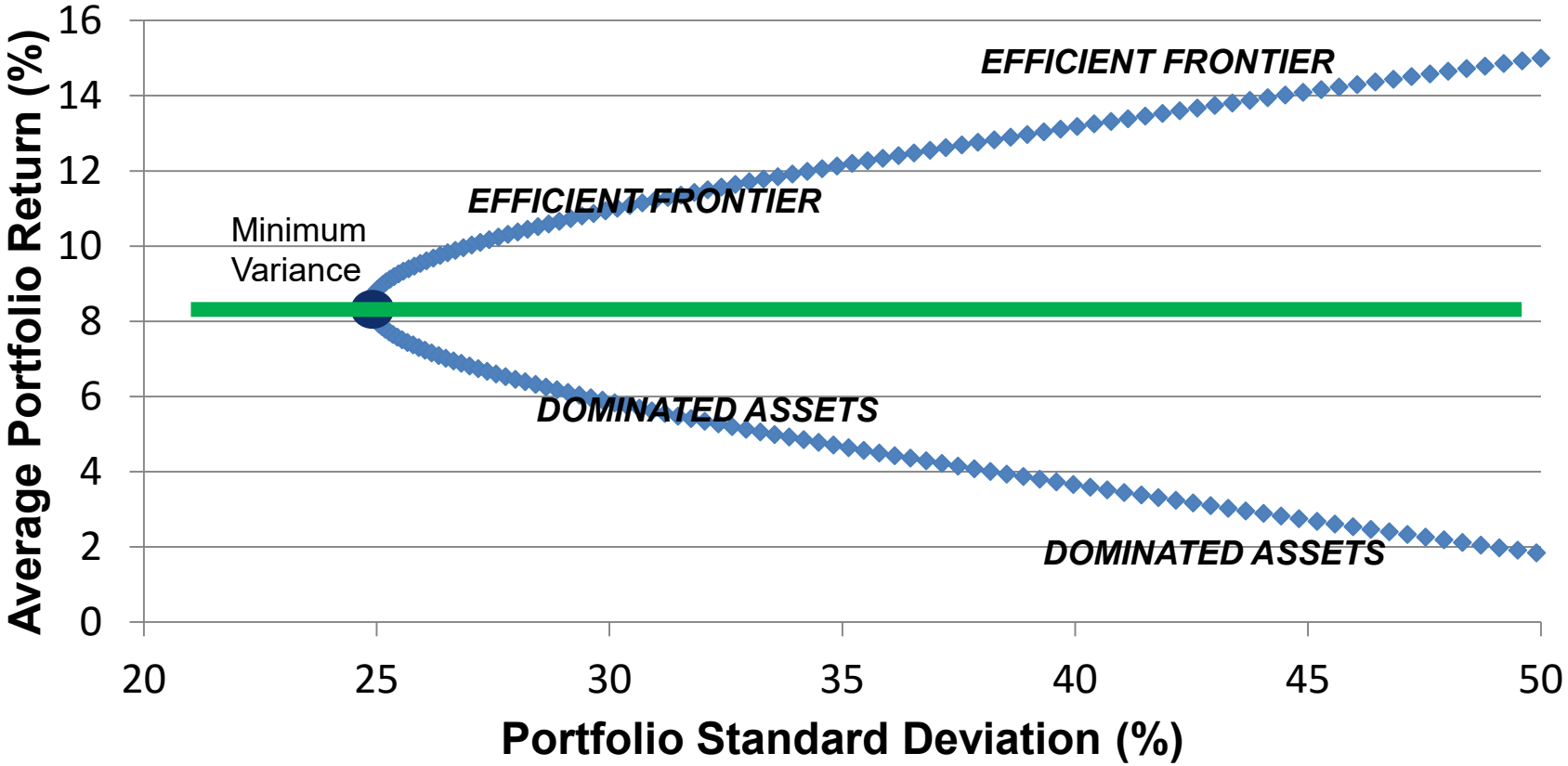
Mean Return: 8%
Standard Deviation: 25%

Small Stocks

Mean Return: 15%
Standard Deviation: 50%

Correlation between the two: 0.4

PORTFOLIO FRONTIER WITH TWO RISKY ASSETS



DOMINATED ASSETS

Can refer to dominated assets as being “inefficient”

A portfolio is *inefficient* if another portfolio combination yields a higher average return with the same standard deviation of returns.

REAL-WORLD APPLICATION

This may save you tens of thousands of dollars!

NO JOKE!

Source: Wikimedia Commons/2bgr8stock (2009)

HOW DOMINATED? EXAMPLE 1

Suppose:

S&P 500 Index Fund A has an annual expense of 0.05%

S&P 500 Index Fund B has an annual expense of 0.40%

S&P 500 has a 10% return each year

HOW DOMINATED?

What is the difference in wealth between the two funds after 10 years (in percent terms)?

After 20 years?

After 40 years?

HOW DOMINATED?

Difference after 10 years:

After 20 years:

After 40 years:

HOW DOMINATED? EXAMPLE 2

Suppose:

S&P 500 Index Fund A has an annual expense of 0.05%

Actively-managed large-cap Fund B has an annual expense of 1.25%

S&P 500 and the large-cap fund each have a 10% return each year

HOW DOMINATED? EXAMPLE 2

What is the difference in wealth between the two funds after 10 years (in percent terms)?

After 20 years?

After 40 years?

HOW DOMINATED?

Difference after 10 years:

After 20 years:

After 40 years:

BASICS OF RETURN & RISK

Over the last 80+ years:

U.S. stock market has outperformed U.S. Treasury Bills by 8% per year on average

Small stocks have outperformed the overall market by a sizeable margin

BASICS OF RETURN & RISK

Wise portfolio formation can reduce risk

- Pay attention to correlation in performance across assets

Risk aversion will determine your asset allocation

“Dominated” assets should be avoided (e.g., same fund, higher fees)

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INVESTMENTS II:
LESSONS & APPLICATIONS FOR INVESTORS

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Fundamentals & Composition of Returns

Capital Asset Pricing Model (CAPM)

REVIEW: CAPITAL ASSET PRICING MODEL (CAPM)

A very brief recap of Module 2 from my first Investments course on Coursera!

SIMPLE DIVERSIFICATION

Source: Juan de Jauregui y Aguilar (1600)

"It is part of a wise man … not to venture all his eggs in one basket."

- Miguel de Cervantes

VARIANCE OF A PORTFOLIO

With 2 assets (N=2):

$$Var[r_p] = \sigma_p^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\rho_{12}\sigma_1\sigma_2$$

With N assets:

$$Var[r_p] = \sigma_p^2 = \sum_{i=1}^{N} w_i^2\sigma_i^2 + 2\sum_{i=1}^{N}\sum_{j>i}^{N} w_i w_j \rho_{ij}\sigma_i\sigma_j$$

$$\sigma_p = \sqrt{\sigma_p^2}$$

AFTER SOME ALGEBRAIC PAIN, THE PUNCH LINE!

If we have an equally weighted portfolio ($w_i = 1/N$) of N assets:

$$\sigma_p^2 = \frac{1}{N}\left[\begin{array}{l}\text{average}\\ \text{variance}\end{array}\right] + \left[1 - \frac{1}{N}\right]\left[\begin{array}{l}\text{average}\\ \text{covariance}\end{array}\right]$$

CAPITAL ASSET PRICING MODEL (CAPM)

Key model to relate the returns assets should earn based on their "risk"

Views assets as "risky" if their performance is sensitive to market-wide conditions

"**BETA**" (β) of a stock is what matters

CAPITAL ASSET PRICING MODEL (CAPM)

Useful for setting a performance benchmark for different types of assets

"**ALPHA**" (α) measures how much an asset outperforms or underperforms

> Alpha is a *risk-adjusted* return that allows one to compare the performance of different assets

A WAY TO MOTIVATE CAPM

Do you hold insurance? If so, you're likely losing money on average!

Why hold a security with an expected negative return?

A WAY TO MOTIVATE CAPM

Insurance loses money for customers on average, but people still demand it. Why?

KEY INSIGHT: Payoffs from insurance differ dramatically depending on what is happening to your wealth! The most highly valued assets pay off when they're needed most.

ANOTHER WAY TO THINK OF CAPM

Two firms with same expected cash flows, but …

Firm A: Does better in good times
Firm B: Does better in bad times

Which firm's stock should trade at a higher price today?

Which firm offers the higher expected return in the future?

ANOTHER WAY TO THINK OF CAPM

Simple answer: Firms A & B have the same expected cash flows so should have the same value today and expected returns in future

ANOTHER WAY TO THINK OF CAPM

Simple answer: Firms A & B have the same expected cash flows so should have the same value today and expected returns in future

CAPM answer: Firm B is more valuable today (and thus has lower future expected/required returns)

CAPM

Insurance & state of the world

The most highly valued assets pay off when they're needed most

Investors are compensated for the **systematic** (macroeconomic) risk of an asset

Investors are NOT compensated for the **idiosyncratic** (asset-specific) risk of an asset

THE CAPITAL ASSET PRICING MODEL (CAPM) EQUATION

SEE MY FIRST COURSE …

Source: Strobridge Litho. Co., Cincinnati & New York (1899)

CAPITAL ASSET PRICING MODEL (CAPM)

The CAPM determines the expected return of a stock:

$$E(r_i) = r_{RF} + \beta_i \left[E(r_{Mkt}) - r_{RF} \right]$$

$$E(r_i) - r_{RF} = \beta_i \left[E(r_{Mkt}) - r_{RF} \right]$$

The expected return depends linearly on the systematic risk of the asset:

$$\beta_i = \frac{Cov(r_{Mkt}, r_i)}{Var(r_{Mkt})}$$

CAPITAL ASSET PRICING MODEL (CAPM)

CAPM: Excess return of a stock is proportional to its beta

$$E(r_i) - r_{RF} = \beta_i \left[E(r_{Mkt}) - r_{RF} \right]$$

Investors are only compensated for the market or systematic risk of an asset, not for the standard deviation of its returns.

ALPHA IN THE CAPM MODEL

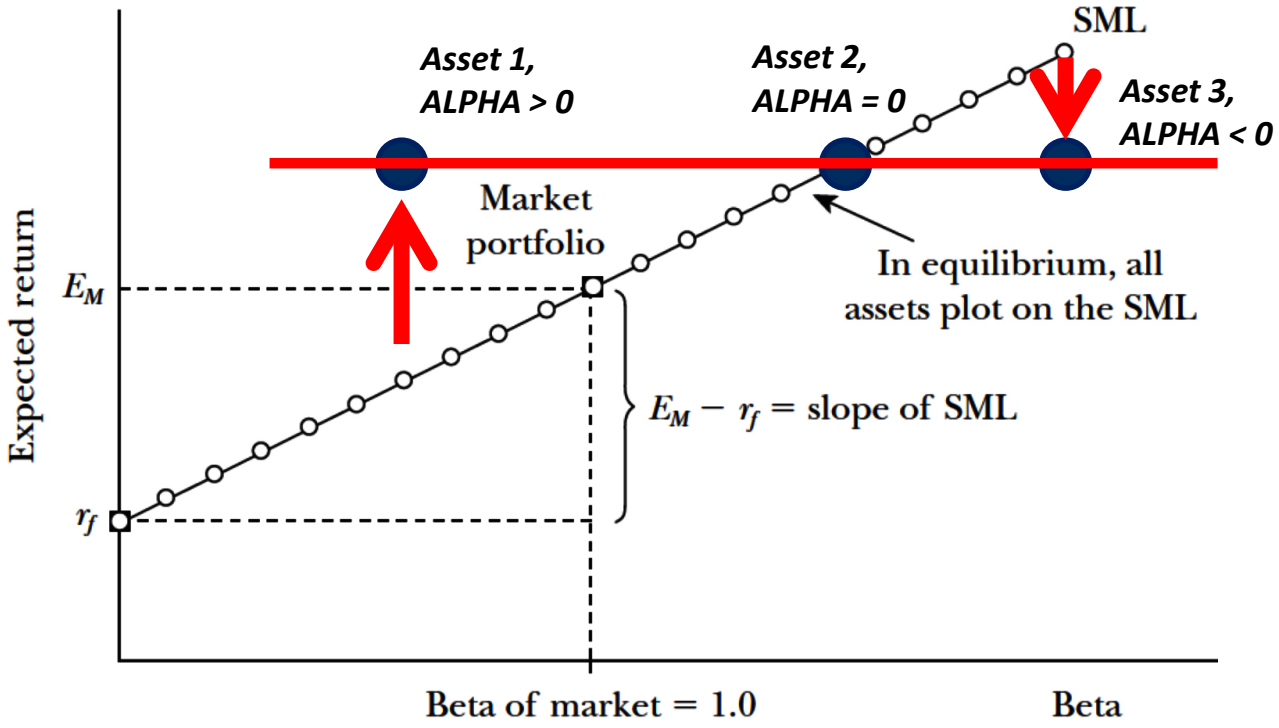
Alpha (α): The performance of an asset relative to its CAPM-predicted return:

$$\alpha_i = \left(r_i\right) - \left[r_{RF} + \beta_i\left(\left(r_{Mkt}\right) - r_{RF}\right)\right]$$

Alpha can be positive, negative, or zero.

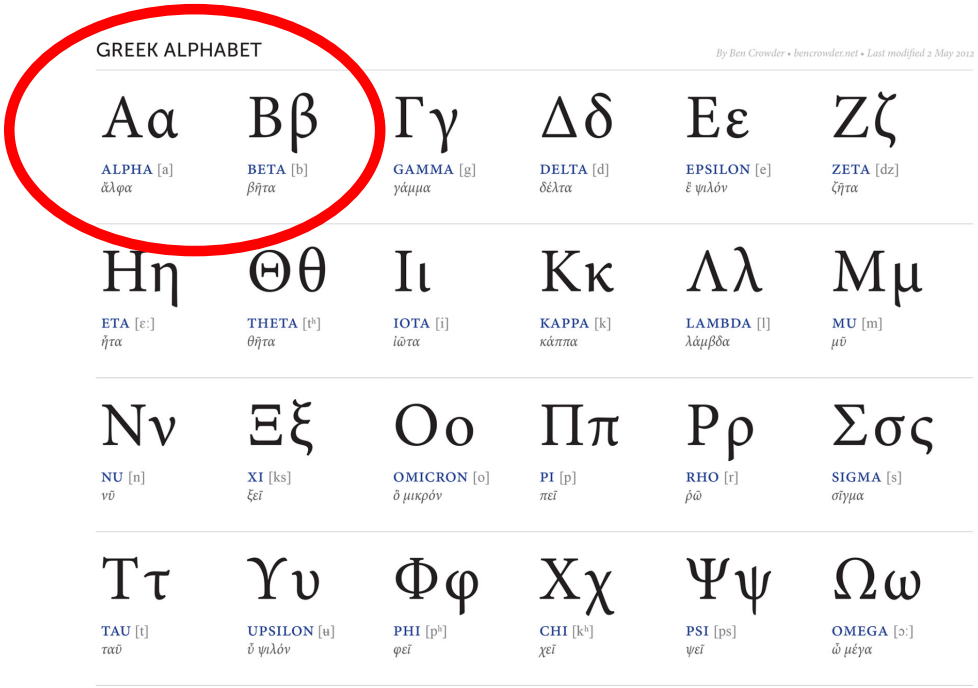
ALPHA & SECURITY MARKET LINE (SML)

An asset whose return is above (below) the SML prediction has outperformed (underperformed) its benchmark and has a positive (negative) ALPHA.



Source: Perold (2004, Figure 4)

THE TWO MOST IMPORTANT LETTERS IN THE GREEK ALPHABET!



Source: Crowder (2012)

BETA

β

BETA: FRONT & CENTER ON STOCK SCREENS!

Apple Inc. (AAPL) - NasdaqGS ★ Watchlist

Add to Portfolio Like 14k

132.54 ↑1.15 (0.88%) May 22, 4:00PM EDT

After Hours : 132.77 0.23 (0.17%) May 22, 7:59PM EDT

Prev Close:	131.39	Day's Range:	131.40 - 132.97
Open:	131.65	52wk Range:	86.64 - 134.54
Bid:	N/A	Volume:	45,595,972
Ask:	132.99 x 100	Avg Vol (3m):	50,914,500
1y Target Est:	148.18	Market Cap:	763.57B
Beta:	0.91	P/E (ttm):	16.47
Earnings Date:	Jul 20 - Jul 24 (Est.)	EPS (ttm):	8.05
		Div & Yield:	2.08 (1.60%)

Source: Yahoo (accessed 2015)

PORTFOLIO THEORY & CAPM: BETA MATTERS!

BETA (β): measure of systematic risk

Standard deviation (σ): measure of total risk

Assets/securities with higher beta should have higher benchmarks

ALPHA

α

ALPHA IS FRONT AND CENTER AS WELL!

MPT Statistics FMAGX

3-Year	5-Year	**10-Year**	15-Year

10-Year Trailing vs. Standard Index	Index	R-Squared	Beta	Alpha
FMAGX	S&P 500 TR USD	90.36	1.19	-2.42
Category: LG	S&P 500 TR USD	87.86	1.02	0.47

04/30/2015

Source: Morningstar (accessed 2015)

CAPM

We can’t simply compare the returns of assets to determine which has performed the “best”

In CAPM world, prices and expected returns should reflect how sensitive an asset’s performance is to the overall market

CAPM is a model that can be used to come up with benchmarks for different assets and securities

CAPM

Not all “risk” is created equal

Two key parameters from CAPM

BETA (β): Sensitivity of asset to the market

ALPHA (α): Over/under-performance of asset

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INVESTMENTS II:
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Fundamentals & Composition of Returns

3-Factor Model and Market Efficiency

REVIEW: 3-FACTOR MODEL & MARKET EFFICIENCY

A very brief recap of Module 3 from my first Investments course on Coursera!

Note: Module 4 of my first Investments course dealt with *Firm Valuation Techniques* – this will NOT be reviewed since it is not needed for THIS course!

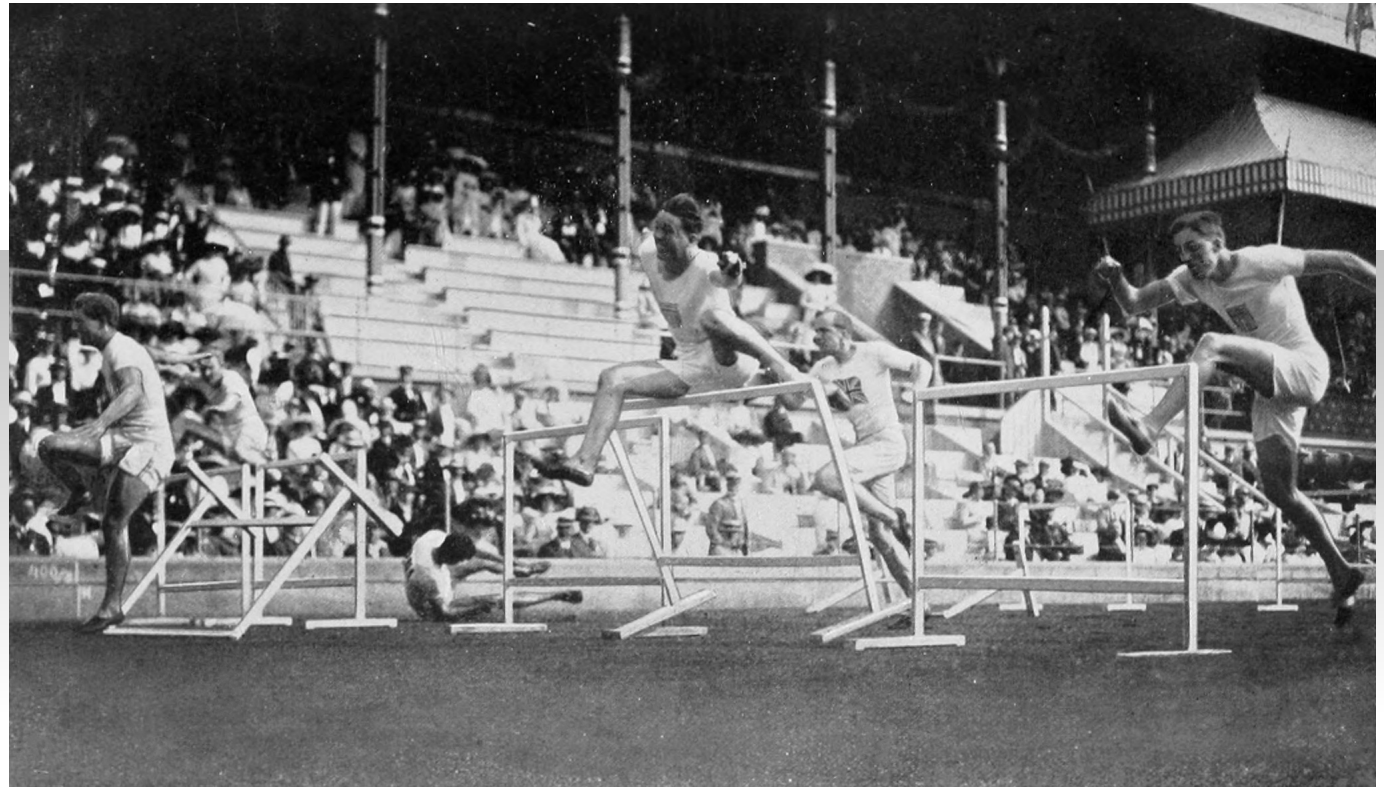
DIFFERENT RACERS…DIFFERENT BENCHMARKS!

Sources: Special Risks Bureau, Flickr (2014)
Pecher (2007)
MacMillan (2006)

POSITIVE ALPHA PERFORMANCE!
EXCEEDED BENCHMARK!

Source: Armstrong (2007)

NEGATIVE ALPHA PERFORMANCE!



Looks like all failed or will fail to clear their “hurdle” rate!

Source: Official Olympic Report (1912)

WHAT IS THE RIGHT HURDLE …

For firms or projects in the future?

To evaluate the past investment performance of a fund manager?

WHAT IS THE RIGHT HURDLE?

Different models provide different benchmarks, different assessments of performance

CAPM is one such model, there are others

If a firm or investment clears its hurdle or benchmark, does this represent luck or skill?

PERFORMANCE OF CAPM

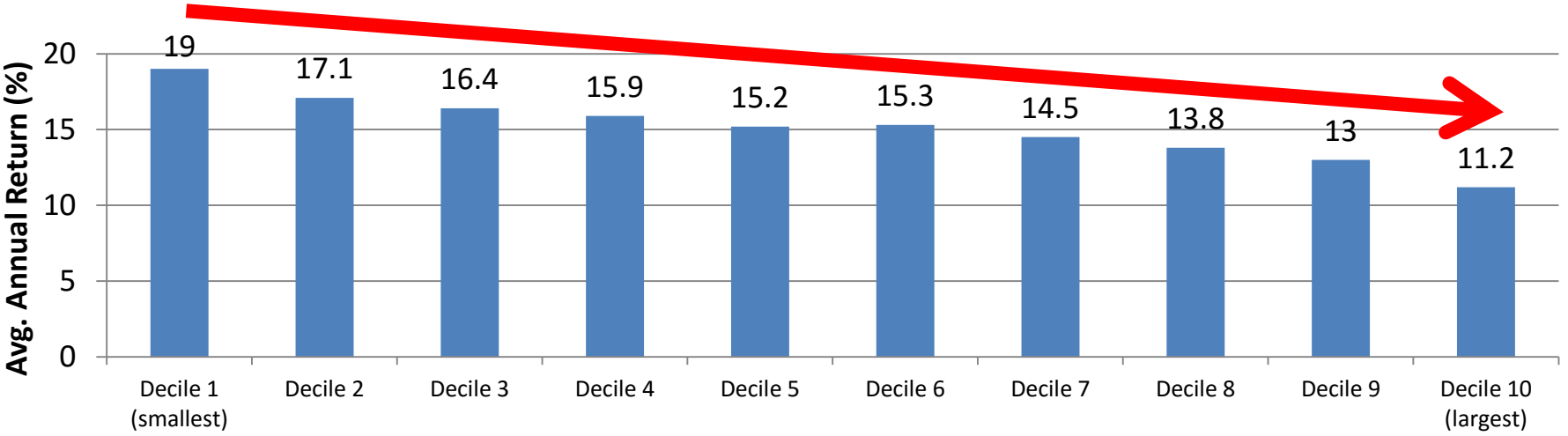
BETA (β) generally does not predict returns as strongly as CAPM would suggest

Other factors that predict returns

- Firm size
- Value/growth
- Momentum

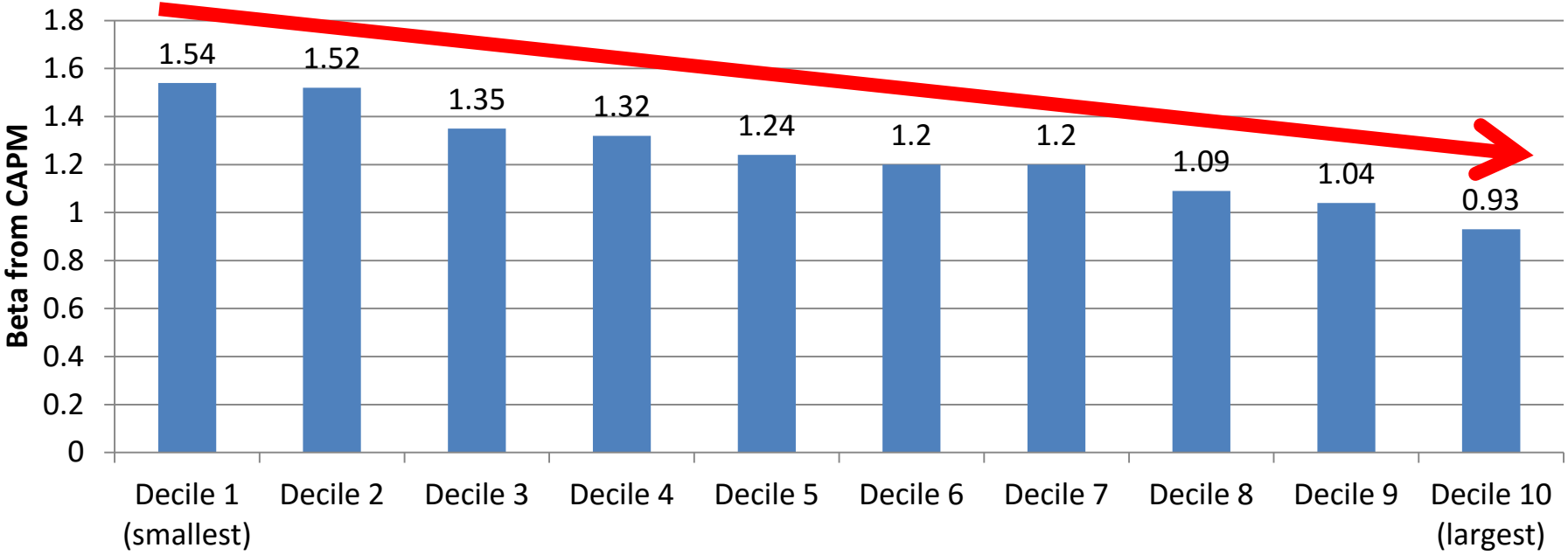
SMALL-FIRM EFFECT IN STOCK RETURNS

Size is based on the market cap of a firm's stock
Sample is annual stock returns 1927-2014



Source: Data retrieved from Kenneth R. French Data Library (accessed 2015)

CAPM BETAS OF THE TEN SIZE PORTFOLIOS



Source: Data retrieved from Kenneth R. French Data Library (accessed 2015)

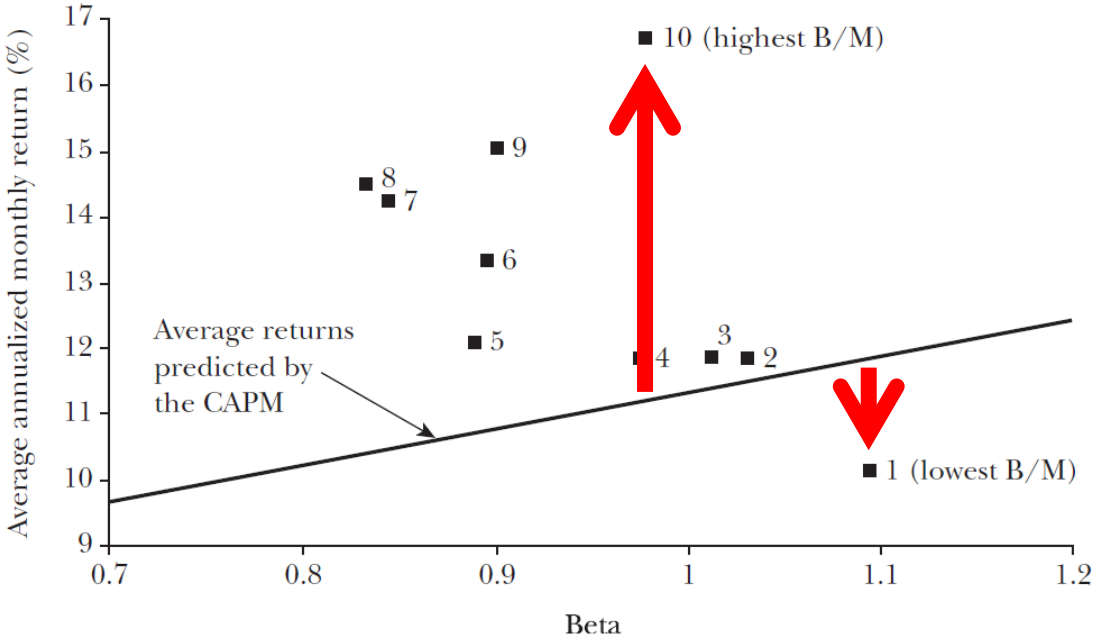
THE FAMOUS VALUE PREMIUM

Ever heard of Warren Buffett?

Source: Hirschey (2005)

BOOK-TO-MARKET PREDICTS RETURNS!

Average Annualized Monthly Return versus Beta for Value Weight Portfolios Formed on B/M, 1963–2003



Source: Fama & French (2004, Figure 3)

FAMA-FRENCH 3-FACTOR MODEL (1993)

Augmented Risk-Return Model:

$$E(r_i) - r_f = \beta_{i,\,MKT} * [E(r_{MKT}) - r_f] + \beta_{i,\,SMB} * E(R_{SMB}) + \beta_{i,\,HML} * E(R_{HML})$$

SMB (Size Factor): Return on a benchmark portfolio of small firms minus return on a portfolio of large firms

HML (Book-to-Market Factor): Return on a benchmark portfolio of high book-to-market (value) firms minus return on a portfolio of low book-to-market (growth) firms

Source: Fama & French (1993)

CAPM & 3-FACTOR MODEL

CAPM has a very nice theoretical appeal: good starting point, but imperfect (but is only a 1-variable model after all!)

CAPM "*Beta*" and "*Alpha*" are frequently reported on common financial websites

CAPM still used a lot in corporate finance settings to assess future discount/hurdle rates (remember the CFO survey!)

Evaluation of investment performance may start but certainly won't stop with CAPM

CAPM & 3-FACTOR MODEL

Multi-Factor models have emerged after the discovery of various patterns in returns

Accounting for different types of risk that are manifested in various patterns of returns

OR simply accounting for factors that predict returns

INTERPRETATION OF MARKET ANOMALIES

Market anomalies might be attributable to three factors (the tough part is determining which one!):

Risk

Irrational Behavior

Data Mining

EFFICIENT MARKET HYPOTHESIS (EMH)

Semi-Strong-Form EMH

Stock prices reflect all publicly available information

This is what most people think of "efficient markets"

EFFICIENT MARKETS & ASSET MANAGEMENT

View on efficient markets should influence investment philosophy

Note that the existence of good performance by some asset managers is not a violation of efficient markets

EFFICIENT MARKETS & ASSET MANAGEMENT

Even in a fully efficient market, some active fund managers will do well (but this would represent luck in this setting)

ASSET MANAGEMENT

Passive Strategy

Buy a well-diversified portfolio without searching for mispriced securities (are not trying to “beat the market,” main concern is asset allocation)

Active Strategy

Buy mispriced securities that are expected to outperform and sell or short those that are expected to underperform (are assuming that you can “beat the market”)

PASSIVE MANAGEMENT VIEW OF WORLD

Hunts Needle in a Haystack

HOW LONG does it take to find a needle in a haystack? Jim Moran, Washington, D. C., publicity man, recently dropped a needle into a convenient pile of hay, hopped in after it, and began an intensive search for (a) some publicity and (b) the needle. Having found the former, Moran abandoned the needle hunt.

Source: Moran (1939)

ACTIVE MANAGEMENT VIEW OF WORLD

Source: Lumb (2000)

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INVESTMENTS II:
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Fundamentals & Composition of Returns

Interpretation of Regression Model Results

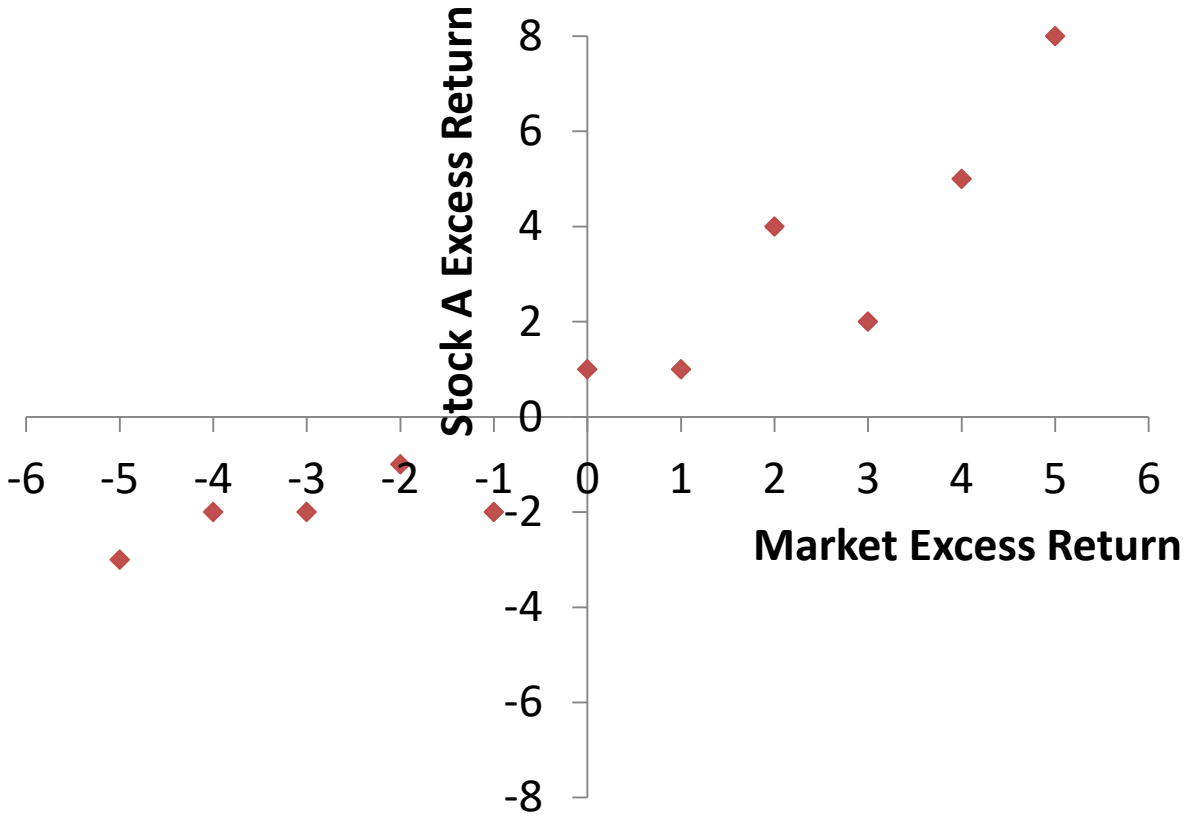
INTERPRETING REGRESSIONS

Will use regression analysis throughout the course

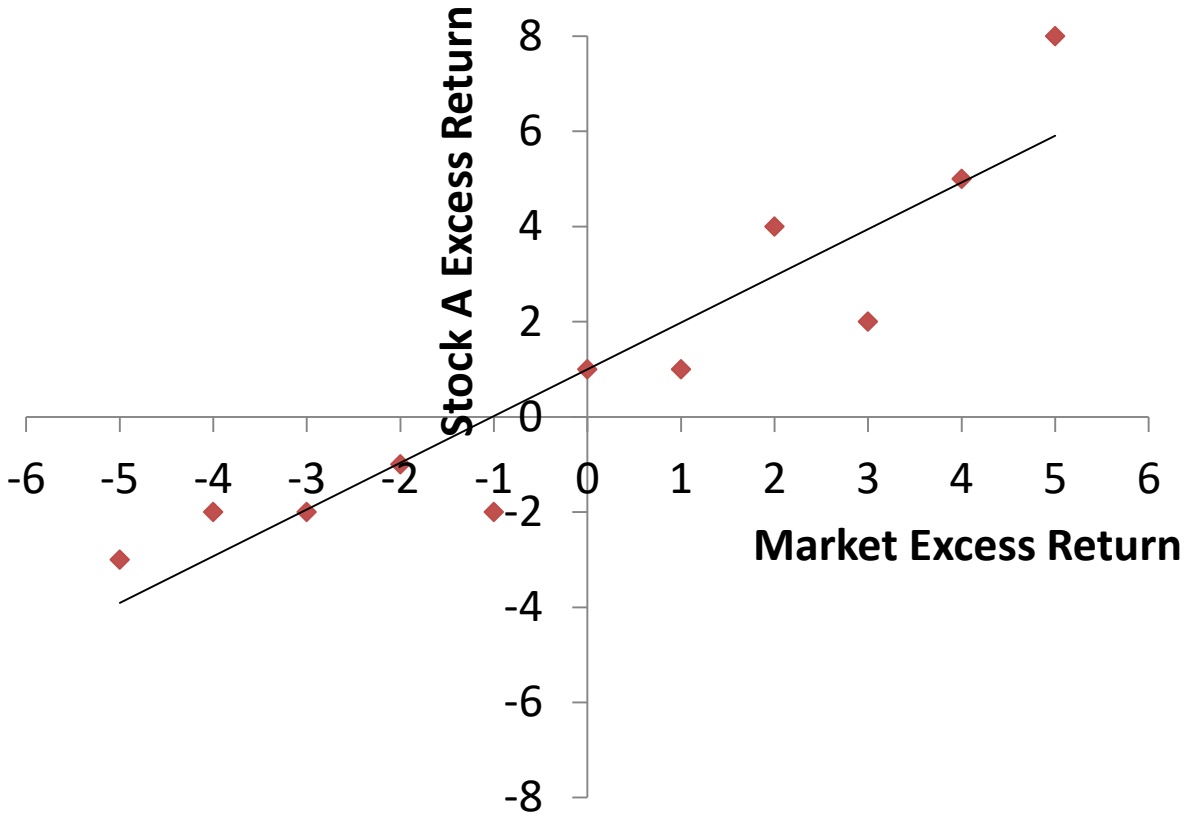
Will interpret regressions conducted by others

Useful to have a quick review of basics of regression analysis

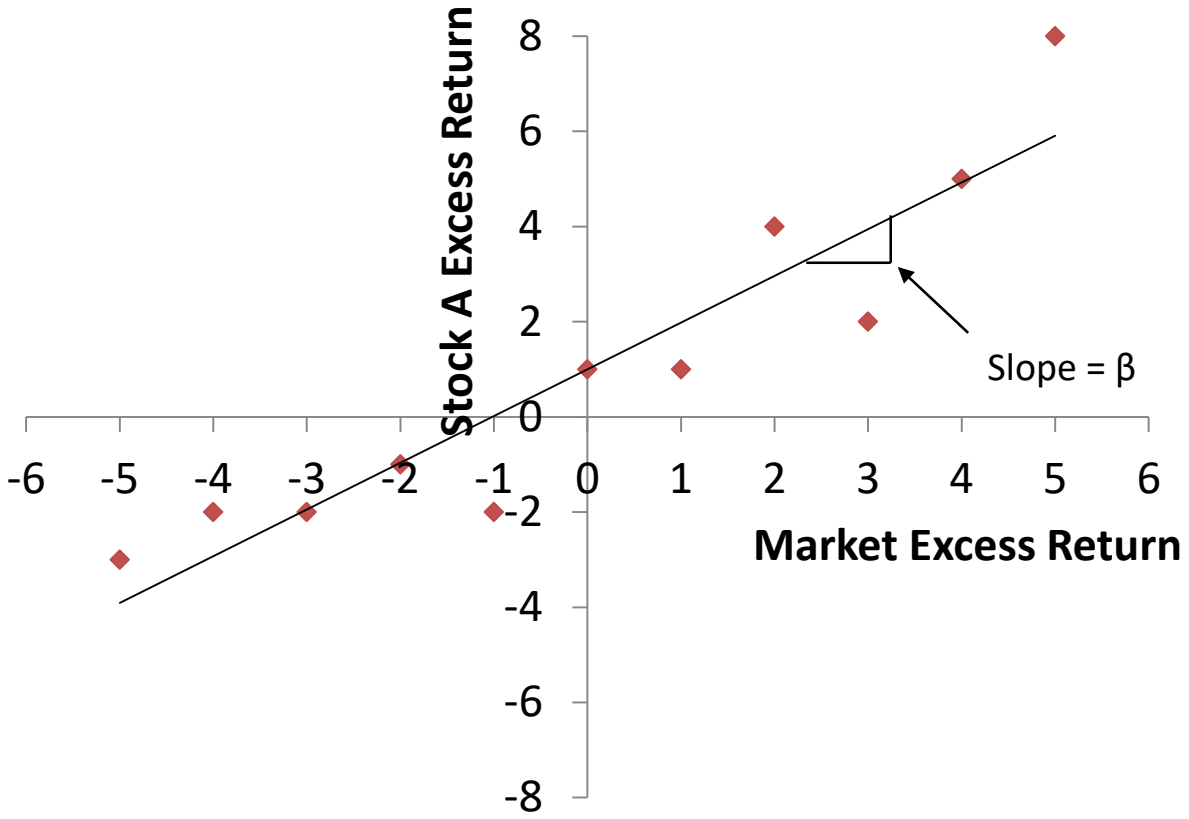
SCATTER PLOT FOR CAPM REGRESSION



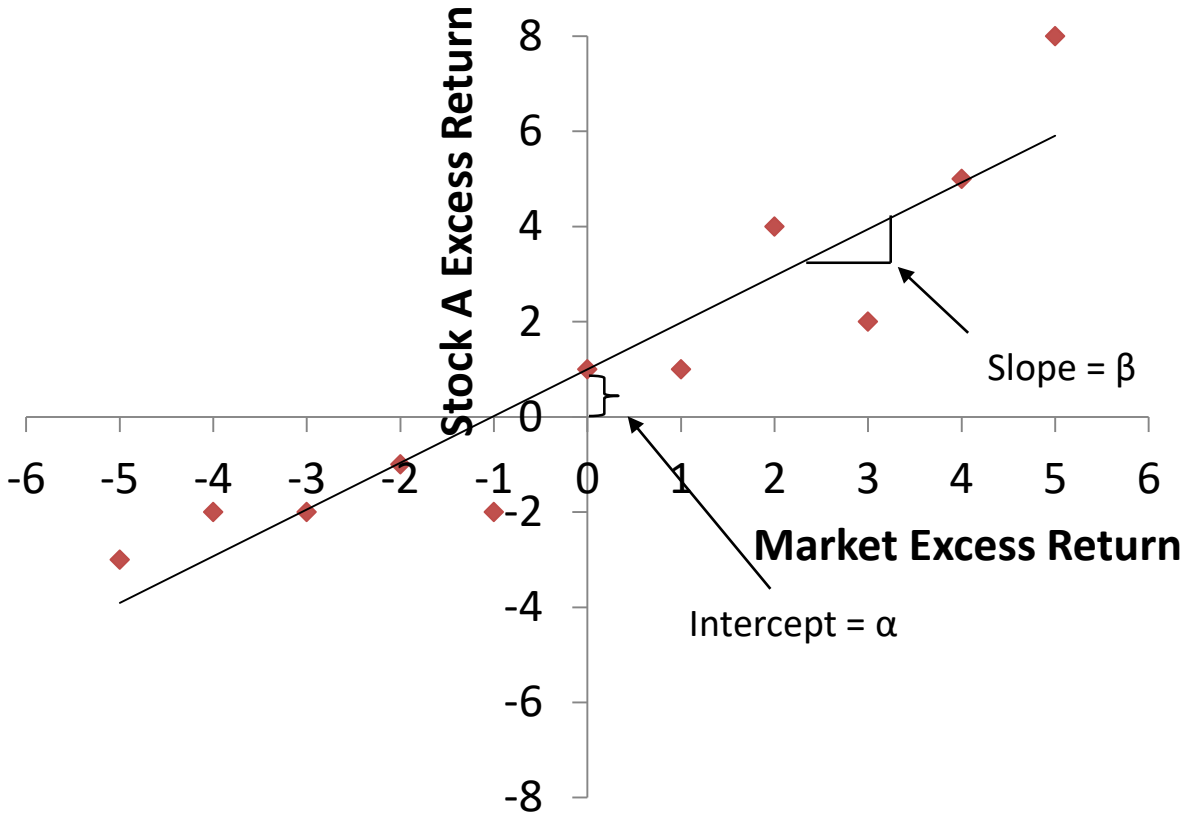
CAPM REGRESSION ANALYSIS



CAPM REGRESSION ANALYSIS



CAPM REGRESSION ANALYSIS



KEY REGRESSION PARAMETERS

Coefficients from regression

Standard errors of those coefficients

Various related measures that indicate the precision of a coefficient estimate

R-squared (goodness of fit of model)

KEY REGRESSION PARAMETERS

p-value, statistical significance level, and *t*-statistic are all commonly reported (and are all related)

***p*-value**: represents the probability of finding the observed coefficient estimate (or more extreme) under the null hypothesis

> Typical null hypothesis to be tested is that the coefficient is zero

KEY REGRESSION PARAMETERS

p-value, statistical significance level, and *t*-statistic are all commonly reported (and are all related)

Statistical significance at the 5% level means the p-value is less than 0.05

> Common statistical significance levels reported are 10%, 5%, and 1% (commonly indicated with one star, two stars, and three stars, respectively)

KEY REGRESSION PARAMETERS

p-value, statistical significance level, and *t*-statistic are all commonly reported (and are all related)

***t*-statistic**: represents the ratio of a coefficient to the standard error of the coefficient (used to test the null hypothesis of a coefficient of zero)

> *t*-statistic magnitude of 2 roughly corresponds to a *p*-value of 0.05 (or statistical significance at the 5% level)

COMMON CUTOFFS USED IN STATISTICS

Common cutoffs used in practice:

- *p*-value of 0.05 or smaller
- statistical significance level of 5%
- *t*-statistic magnitude of 2 or more

Assuming are using significance level of 5%, one can statistically reject the hypothesis that a coefficient equals "X" if the estimate is at least two standard errors from "X"

KEY REGRESSION PARAMETERS

R-squared (or $\mathbf{R^2}$) is a goodness of fit measure for the regression

Technically, it measures how much of the variability in the dependent variables is explained by the independent variable(s)

R-squared is between zero and one

LINEAR REGRESSION OF COCA-COLA RETURNS

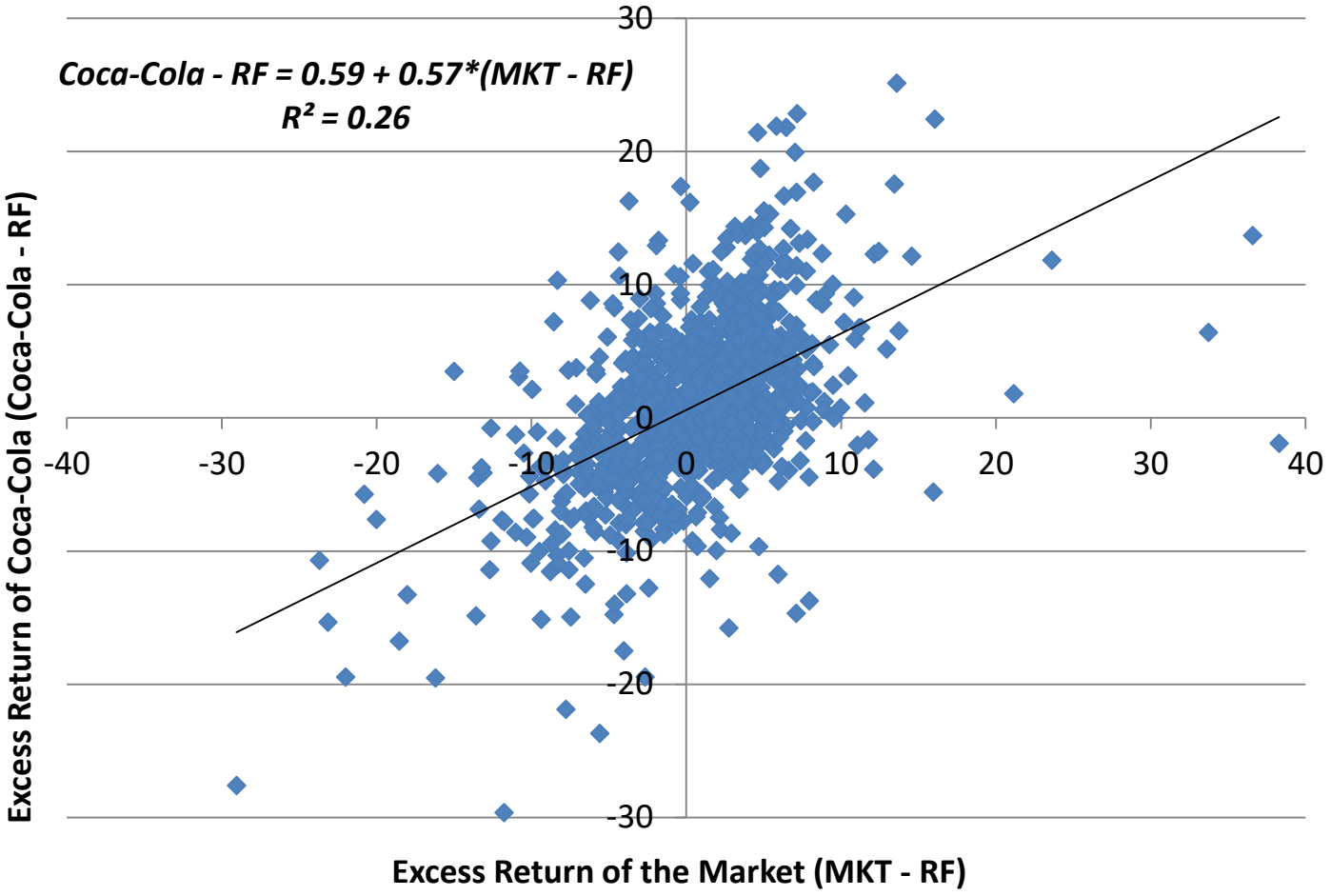
The Coca-Cola linear regression (CAPM equation):

$$r_{Coke} - r_{RF} = \alpha_{Coke} + \beta_{Coke} * \left[r_{Mkt} - r_{RF} \right] + \varepsilon_{Coke}$$

Key regression parameters:

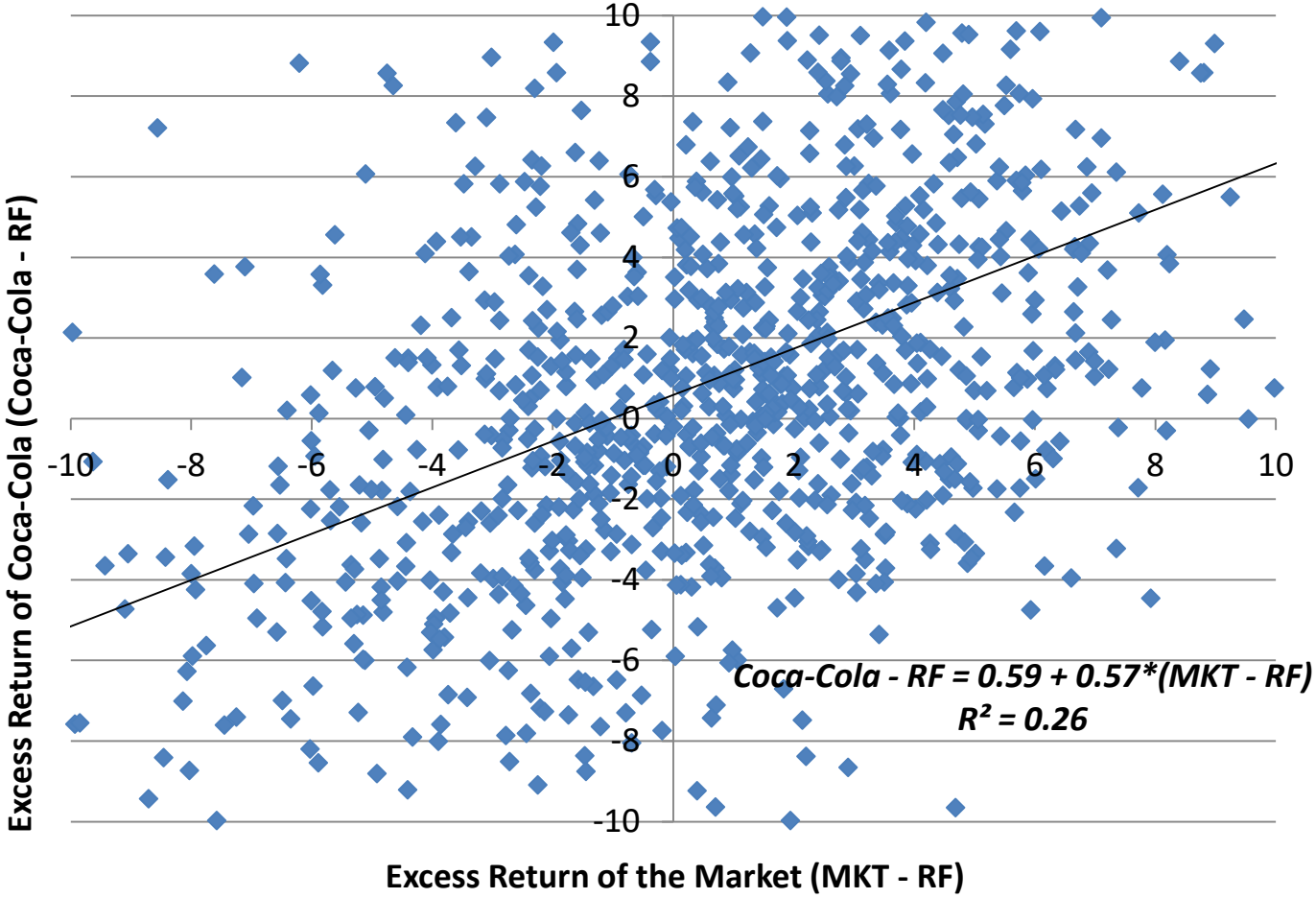
Beta
Alpha
R-squared

SCATTER PLOT OF COCA-COLA AND THE MARKET: CAPM



Source: Calculations based on Coca Cola stock returns obtained from the Center for Research in Security Prices (CRSP) database.

SCATTER PLOT OF COCA-COLA AND THE MARKET: CAPM



Source: Calculations based on Coca Cola stock returns obtained from the Center for Research in Security Prices (CRSP) database.

COCA-COLA EXCEL REGRESSION OUTPUT

SUMMARY OUTPUT						
Regression Statistics						
R Square	**0.260477207**					
Observations	1020					
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	**0.59473967**	0.166894025	3.563577	0.000383	0.267244019	0.922235322
mkt_rf	**0.574391202**	0.03033366	18.93577	9.67E-69	0.514867552	0.633914852

Coca-Cola - RF = 0.59 + 0.57(MKT - RF)*
R^2 = 0.26

BETA = coefficient on excess market return (Mkt-RF) in the regression = 0.57

ALPHA = intercept/constant in the regression = 0.59

R-squared = the fraction of variability of excess return explained by movements in the market = 0.26

Source: Calculations based on Coca Cola stock returns obtained from the Center for Research in Security Prices (CRSP) database.

COCA-COLA REGRESSION OUTPUT

SUMMARY OUTPUT						
Regression Statistics						
R Square	**0.260477207**					
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mkt_rf	**0.574391202**	0.03033366	18.93577	9.67E-69	0.514867552	0.633914852

BETA = 0.57

This beta estimate is precisely measured (small standard error), can statistically reject that Coca-Cola beta is 1.0

Coca-Cola is a “defensive” stock, benchmark is lower than that for the whole stock market

Source: Calculations based on Coca Cola stock returns obtained from the Center for Research in Security Prices (CRSP) database.

COCA-COLA REGRESSION OUTPUT

SUMMARY OUTPUT						
Regression Statistics						
R Square	**0.260477207**					
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mkt_rf	**0.574391202**	0.03033366	18.93577	9.67E-69	0.514867552	0.633914852

ALPHA = 0.59% per month

Coca-Cola has beat its benchmark historically by a wide margin

Source: Calculations based on Coca Cola stock returns obtained from the Center for Research in Security Prices (CRSP) database.

COCA-COLA REGRESSION OUTPUT

SUMMARY OUTPUT						
Regression Statistics						
R Square	**0.260477207**					
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mkt_rf	**0.574391202**	0.03033366	18.93577	9.67E-69	0.514867552	0.633914852

R-squared = 0.26

Only a small portion of movements are explained by the market (0.26), 0.74 of Coca-Cola variability explained by idiosyncratic factors

Source: Calculations based on Coca Cola stock returns obtained from the Center for Research in Security Prices (CRSP) database.

ALPHA, BETA, AND R-SQUARED

Morningstar, a key financial website, reports *alpha*, *beta*, and the *R-squared* from a CAPM regression for mutual funds

Now we know how to interpret these statistics!

LET'S CHECK OUT TWO FIDELITY FUNDS

MPT Statistics FCNTX

3-Year | 5-Year | 10-Year | **15-Year**

Fidelity® Contrafund® Fund FCNTX

15-Year Trailing	Index	R-Squared	Beta	Alpha
vs. Standard Index				
FCNTX	S&P 500 TR USD	82.20	0.81	3.51
Category: LG	S&P 500 TR USD	86.65	1.04	-0.46

MPT Statistics FMAGX

3-Year | 5-Year | 10-Year | **15-Year**

Fidelity® Magellan® Fund FMAGX

15-Year Trailing	Index	R-Squared	Beta	Alpha
vs. Standard Index				
FMAGX	S&P 500 TR USD	91.70	1.13	-2.17
Category: LG	S&P 500 TR USD	86.65	1.04	-0.46

07/31/2016

Source: Morningstar (accessed 2016)

LET'S CHECK OUT TWO FIDELITY FUNDS

MPT Statistics FCNTX

3-Year | 5-Year | 10-Year | **15-Year**

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LET'S CHECK OUT TWO FIDELITY FUNDS

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LET'S CHECK OUT TWO FIDELITY FUNDS

MPT Statistics FCNTX

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07/31/2016

Source: Morningstar (accessed 2016)

REFERENCES

Center for Research in Security Prices (CRSP) database.

Morningstar. (n.d.). Fidelity Contrafund Fund. Retrieved on July 31, 2016 from http://performance.morningstar.com/fund/ratings-risk.action?t=FCNTX&region=usa&culture=en_US

Morningstar. (n.d.). Fidelity Magellan Fund. Retrieved July 31, 2016 from http://performance.morningstar.com/fund/ratings-risk.action?t=FMAGX&region=usa&culture=en_US

INVESTMENTS II:
LESSONS & APPLICATIONS FOR INVESTORS

SCOTT WEISBENNER

Fundamentals & Composition of Returns

Regression Analysis of Returns to Small-Value Stocks

LET'S ANALYZE SMALL-VALUE STRATEGY

Data from Kenneth R. French Online Data Library

Spreadsheet:
SmallValue_1927_2014.xlsx

MONTHLY RETURN SERIES DEFINED

"**Mkt_RF**" = Return of value-weighted U.S. stock market minus 1-month U.S. Treasury Bill rate

"**SMB**" = Return of small stocks minus the return of big stocks (based on market capitalization)

"**HML**" = Return of high book-to-market stocks (value) minus low book-to-market stocks (growth)

MONTHLY RETURN SERIES DEFINED

"**RF**" = 1-month U.S. Treasury Bill rate

"**SmallValue**" = Return of a portfolio of small, value stocks

"**SmallValue_RF**" = Return of a portfolio of small, value stocks minus 1-month U.S. Treasury Bill rate

MONTHLY RETURN SERIES DEFINED

For classification cutoffs for size and value, see:

http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/f-f_factors.html

FILL IN TABLE FOR SMALL-VALUE STOCKS

Averages & CAPM	Analysis of Small-Value Stocks
Average return (in %)	
Average excess return (in %)	
CAPM alpha (in %)	
CAPM market beta	
R-squared from CAPM	

ANALYSIS: 3-FACTOR MODEL

Estimate a regression using monthly data of:

> *SmallValue_RF* upon *Mkt_RF*, *SMB*, and *HML*

What is the R-squared?

> Is there much idiosyncratic risk?

ANALYSIS: 3-FACTOR MODEL

What do the coefficients on the size factor (*SMB*) and the value factor (*HML*) mean?

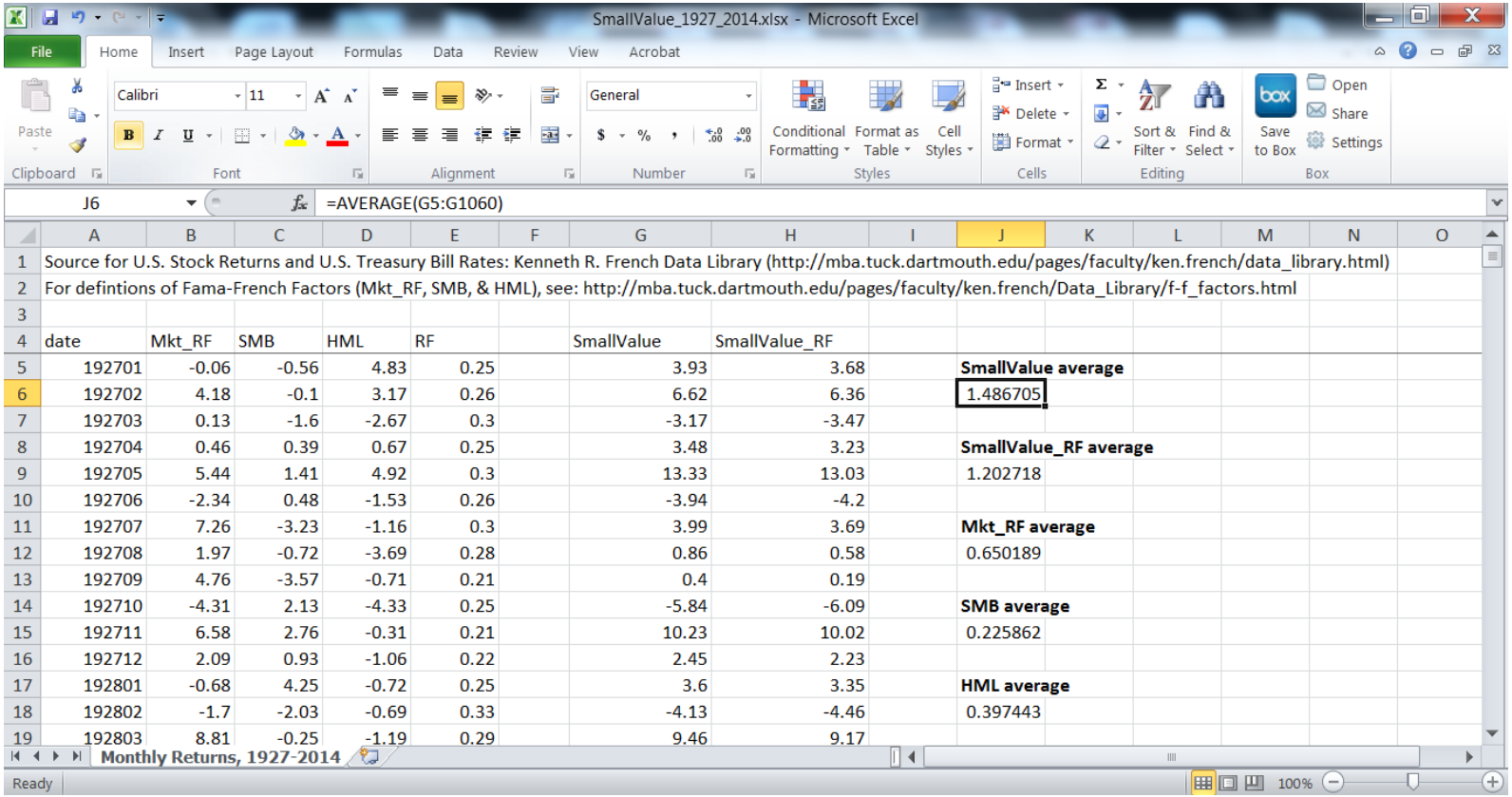
What is the ALPHA in 3-Factor Model?

Why did the ALPHA change from the CAPM to the 3-Factor Model?

FILL IN TABLE FOR SMALL-VALUE STOCKS

3-Factor Model	Analysis of Small-Value Stocks
3-Factor alpha (in %)	
3-Factor market beta	
3-Factor size beta	
3-Factor value beta	
R-squared from 3-Factor Model	

AVERAGE RETURN CALCULATIONS



SmallValue_1927_2014.xlsx - Microsoft Excel

J6: =AVERAGE(G5:G1060)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Source for U.S. Stock Returns and U.S. Treasury Bill Rates: Kenneth R. French Data Library (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)														
2	For defintions of Fama-French Factors (Mkt_RF, SMB, & HML), see: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/f-f_factors.html														
3															
4	date	Mkt_RF	SMB	HML	RF		SmallValue	SmallValue_RF							
5	192701	-0.06	-0.56	4.83	0.25		3.93	3.68		**SmallValue average**					
6	192702	4.18	-0.1	3.17	0.26		6.62	6.36		1.486705					
7	192703	0.13	-1.6	-2.67	0.3		-3.17	-3.47							
8	192704	0.46	0.39	0.67	0.25		3.48	3.23		**SmallValue_RF average**					
9	192705	5.44	1.41	4.92	0.3		13.33	13.03		1.202718					
10	192706	-2.34	0.48	-1.53	0.26		-3.94	-4.2							
11	192707	7.26	-3.23	-1.16	0.3		3.99	3.69		**Mkt_RF average**					
12	192708	1.97	-0.72	-3.69	0.28		0.86	0.58		0.650189					
13	192709	4.76	-3.57	-0.71	0.21		0.4	0.19							
14	192710	-4.31	2.13	-4.33	0.25		-5.84	-6.09		**SMB average**					
15	192711	6.58	2.76	-0.31	0.21		10.23	10.02		0.225862					
16	192712	2.09	0.93	-1.06	0.22		2.45	2.23							
17	192801	-0.68	4.25	-0.72	0.25		3.6	3.35		**HML average**					
18	192802	-1.7	-2.03	-0.69	0.33		-4.13	-4.46		0.397443					
19	192803	8.81	-0.25	-1.19	0.29		9.46	9.17							

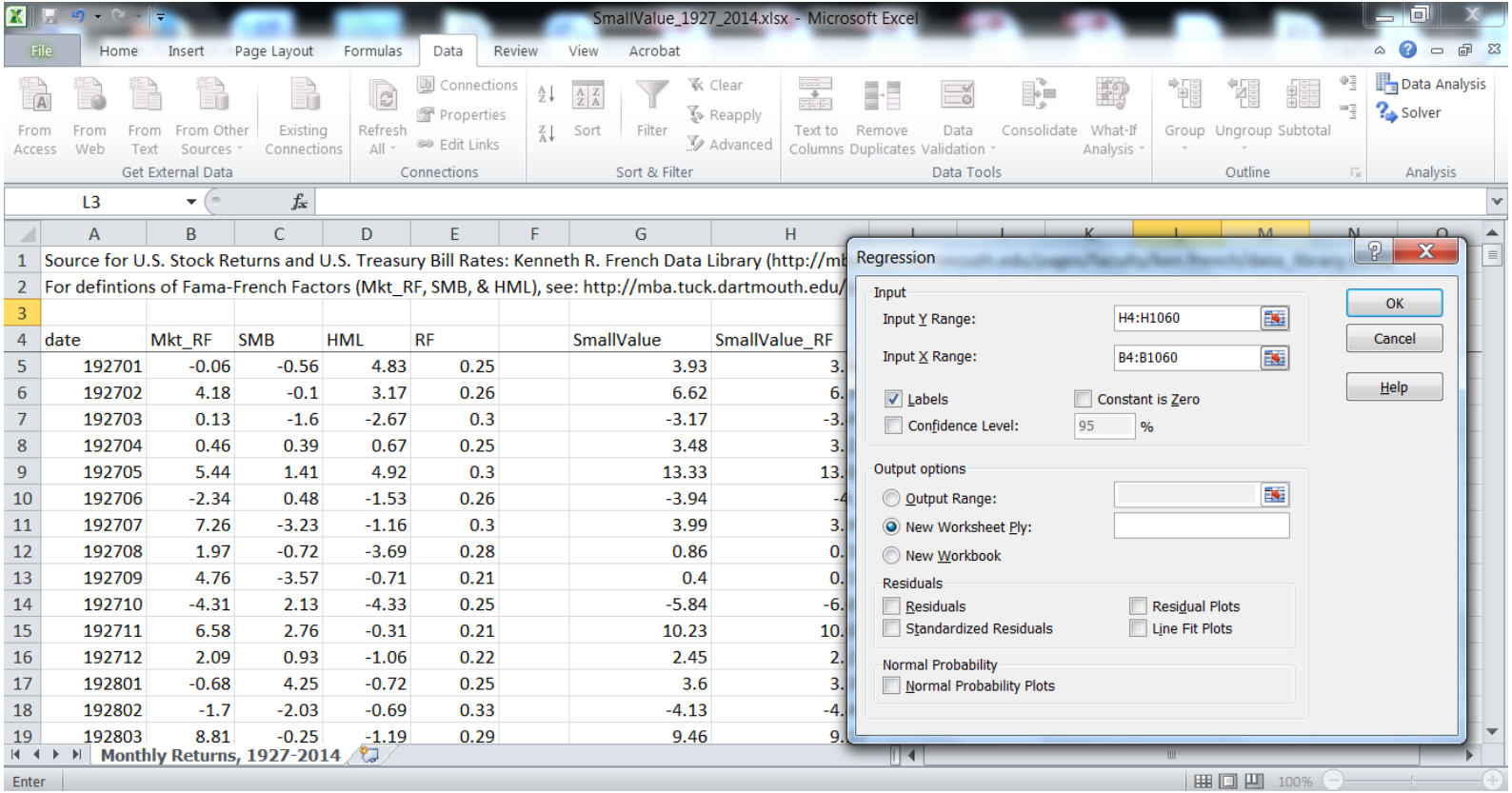
Monthly Returns, 1927-2014

Ready

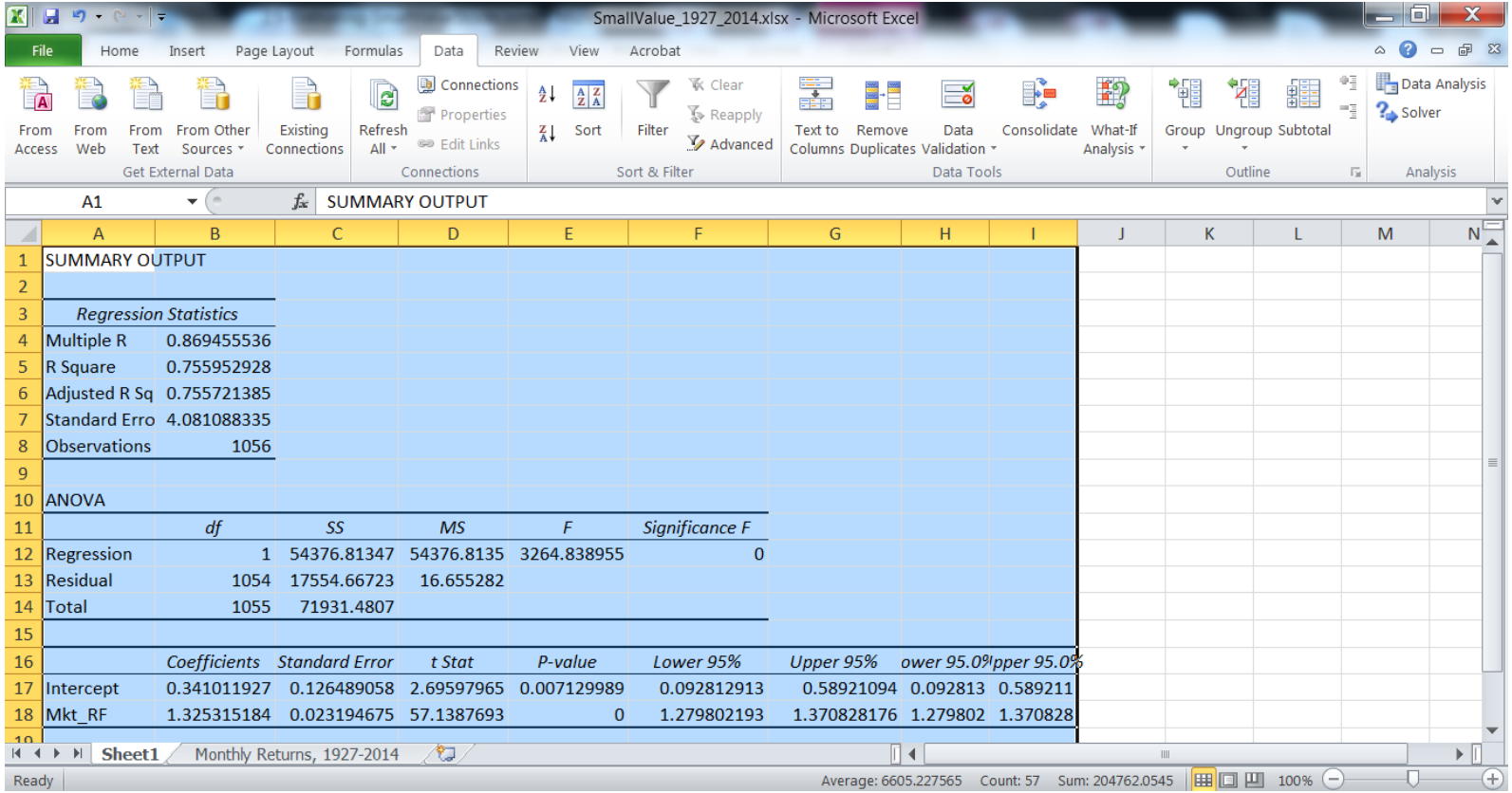
AVERAGE MONTHLY RETURNS, 1927-2014

Security	Average Monthly Return
Small-Value Stocks Return (*SmallValue*)	1.49%
Small-Value Stocks Excess Return (*SmallValue_RF*)	1.20%
US Stock Market Excess Return (*Mkt_RF*)	0.65%
Small-Cap minus Large-Cap Stocks (*SMB*)	0.23%
Value minus Growth Stocks (*HML*)	0.40%

CAPM REGRESSION COMMAND



CAPM REGRESSION OUTPUT



	A	B	C	D	E	F	G	H	I
1	SUMMARY OUTPUT								
2									
3	*Regression Statistics*								
4	Multiple R	0.869455536							
5	R Square	0.755952928							
6	Adjusted R Sq	0.755721385							
7	Standard Erro	4.081088335							
8	Observations	1056							
9									
10	ANOVA								
11		*df*	*SS*	*MS*	*F*	*Significance F*			
12	Regression	1	54376.81347	54376.8135	3264.838955	0			
13	Residual	1054	17554.66723	16.655282					
14	Total	1055	71931.4807						
15									
16		*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
17	Intercept	0.341011927	0.126489058	2.69597965	0.007129989	0.092812913	0.58921094	0.092813	0.589211
18	Mkt_RF	1.325315184	0.023194675	57.1387693	0	1.279802193	1.370828176	1.279802	1.370828

CAPM REGRESSION OUTPUT

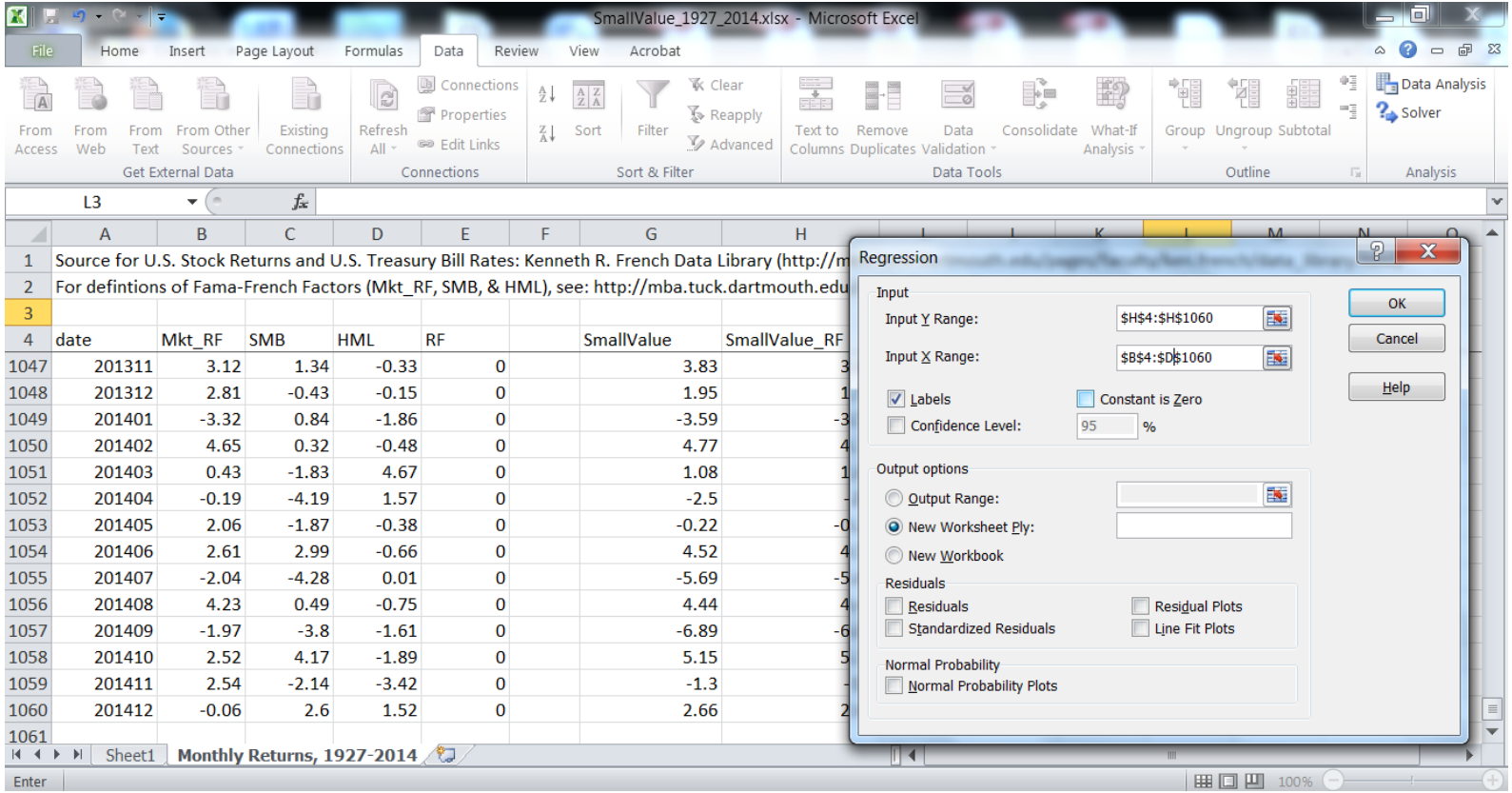
Regression Statistics				
Multiple R	0.869455536			
R Square	0.755952928			
Adjusted R Sq	0.755721385			
Standard Erro	4.081088335			
Observations	1056			
ANOVA				
	df	*SS*	*MS*	*F*
Regression	1	54376.81347	54376.8135	3264.838955
Residual	1054	17554.66723	16.655282	
Total	1055	71931.4807		
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.341011927	0.126489058	2.69597965	0.007129989
Mkt_RF	1.325315184	0.023194675	57.1387693	0

Sheet1 Monthly Returns, 1927-2014

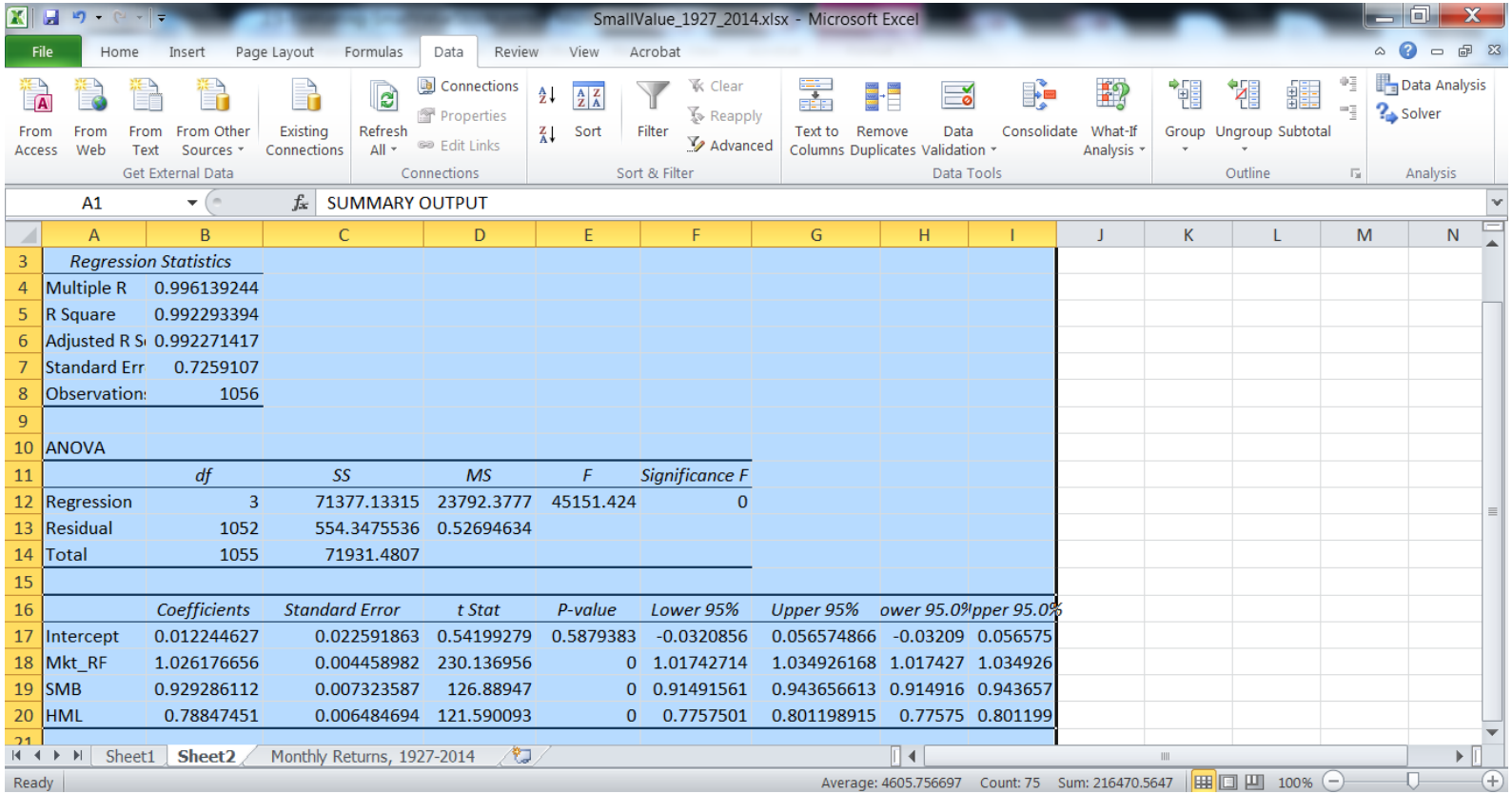
FILL IN TABLE FOR SMALL-VALUE STOCKS

Averages & CAPM	Analysis of Small-Value Stocks
Average return (in %)	1.49%
Average excess return (in %)	1.20%
CAPM alpha (in %)	0.34%
CAPM market beta	1.33
R-squared from CAPM	0.76

3-FACTOR MODEL REGRESSION



3-FACTOR MODEL REGRESSION OUTPUT



	A	B	C	D	E	F	G	H	I
3	*Regression Statistics*								
4	Multiple R	0.996139244							
5	R Square	0.992293394							
6	Adjusted R S	0.992271417							
7	Standard Err	0.7259107							
8	Observation	1056							
9									
10	ANOVA								
11		*df*	*SS*	*MS*	*F*	*Significance F*			
12	Regression	3	71377.13315	23792.3777	45151.424	0			
13	Residual	1052	554.3475536	0.52694634					
14	Total	1055	71931.4807						
15									
16		*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
17	Intercept	0.012244627	0.022591863	0.54199279	0.5879383	-0.0320856	0.056574866	-0.03209	0.056575
18	Mkt_RF	1.026176656	0.004458982	230.136956	0	1.01742714	1.034926168	1.017427	1.034926
19	SMB	0.929286112	0.007323587	126.88947	0	0.91491561	0.943656613	0.914916	0.943657
20	HML	0.78847451	0.006484694	121.590093	0	0.7757501	0.801198915	0.77575	0.801199

3-FACTOR MODEL REGRESSION OUTPUT

Regression Statistics	
Multiple R	0.996139244
R Square	0.992293394
Adjusted R S	0.992271417
Standard Err	0.7259107
Observation	1056

ANOVA

	df	*SS*	*MS*	*F*	S
Regression	3	71377.13315	23792.3777	45151.424	
Residual	1052	554.3475536	0.52694634		
Total	1055	71931.4807			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.012244627	0.022591863	0.54199279	0.5879383
Mkt_RF	1.026176656	0.004458982	230.136956	0
SMB	0.929286112	0.007323587	126.88947	0
HML	0.78847451	0.006484694	121.590093	0

Sheet1 | **Sheet2** | Monthly Returns, 1927-2014

FILL IN TABLE FOR SMALL-VALUE STOCKS

3-Factor Model	Analysis of Small-Value Stocks
3-Factor alpha (in %)	0.01%
3-Factor market beta	1.03
3-Factor size beta	0.93
3-Factor value beta	0.79
R-squared from 3-Factor Model	0.99

REFERENCES

French, K. R. (n.d.). *Data library*. Data on U.S. stock returns & Treasury Bill rates retrieved in 2015 from http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

INVESTMENTS II:
LESSONS & APPLICATIONS FOR INVESTORS

SCOTT WEISBENNER

Fundamentals & Composition of Returns

Dividends, Capital Gains, and Firm Payout Policy

RETURNS, TAXES, AND CORPORATE FINANCE

WHAT WE MEAN BY “RETURN”

The return of a security or asset is the change in price plus any cash payout received normalized by the beginning-of-period price

$$Return_t = (Price_t - Price_{t-1} + Dividend_t) / Price_{t-1}$$

CORPORATE FINANCIAL POLICY & RETURNS

Corporate financial policy determines the type of securities offered to investors

Corporate dividend policy determines the type of return stockholders receive (i.e., cash or capital gains)

FIRM PAYOUT CHOICE

Firms face a payout policy choice: Should they pay out their earnings as cash dividends to investors, or should they plough their earnings back into the firm?

There is a third choice: Use earnings to repurchase the firm's own stock

PAUSE, THINK, AND ANSWER!

Source: Haklai (2012)

QUESTION

If you own a stock, would you prefer to receive returns from that investment in the form of capital gains or dividends?

Why?

DISCUSSION
OF QUESTION

If you own a stock, would you prefer to receive returns from that investment in the form of capital gains or dividends?

Why?

FIRM PAYOUT CHOICE

Should the firm payout choice matter to investors?

Franco Modigliani and Merton Miller in the late 1950s and early 1960s discuss that corporate financial policy (like dividend policy) should not affect firm value and thus investors should not care about it

CASE STUDY OF MICROSOFT

As an investor in Microsoft stock,
have seen a dramatic change in the
composition of your returns over time

CASE STUDY OF MICROSOFT

1986-2002

All returns in the form of capital gains (changes in share price)

No cash dividends paid

2003-2012

The stock price is essentially unchanged, around $27 both 1/2003 and 12/2012, so no capital gains

$7.54 in cash dividends paid per share over this period

FIRM PAYOUT CHOICE

A couple important dimensions to the dividend payout choice in the real world:

- Tax considerations for ***taxable investors***
- Signal sent by firm to investors when commit to a stream of cash payments

FIRM PAYOUT CHOICE: TAX CONSIDERATIONS

As a taxable investor in the U.S., the type of returns a stock yields has consequences for your *after-tax* return

FIRM PAYOUT CHOICE: TAX CONSIDERATIONS

Dividends are taxed on an annual basis (like labor income and interest)

Capital gains on a stock are also taxed (but only when sell the stock)

> Tax rate on capital gains depends on how long you owned the stock before selling it (i.e., is it short-term or long-term status)

U.S. TAXES ON DIVIDENDS & CAPITAL GAINS

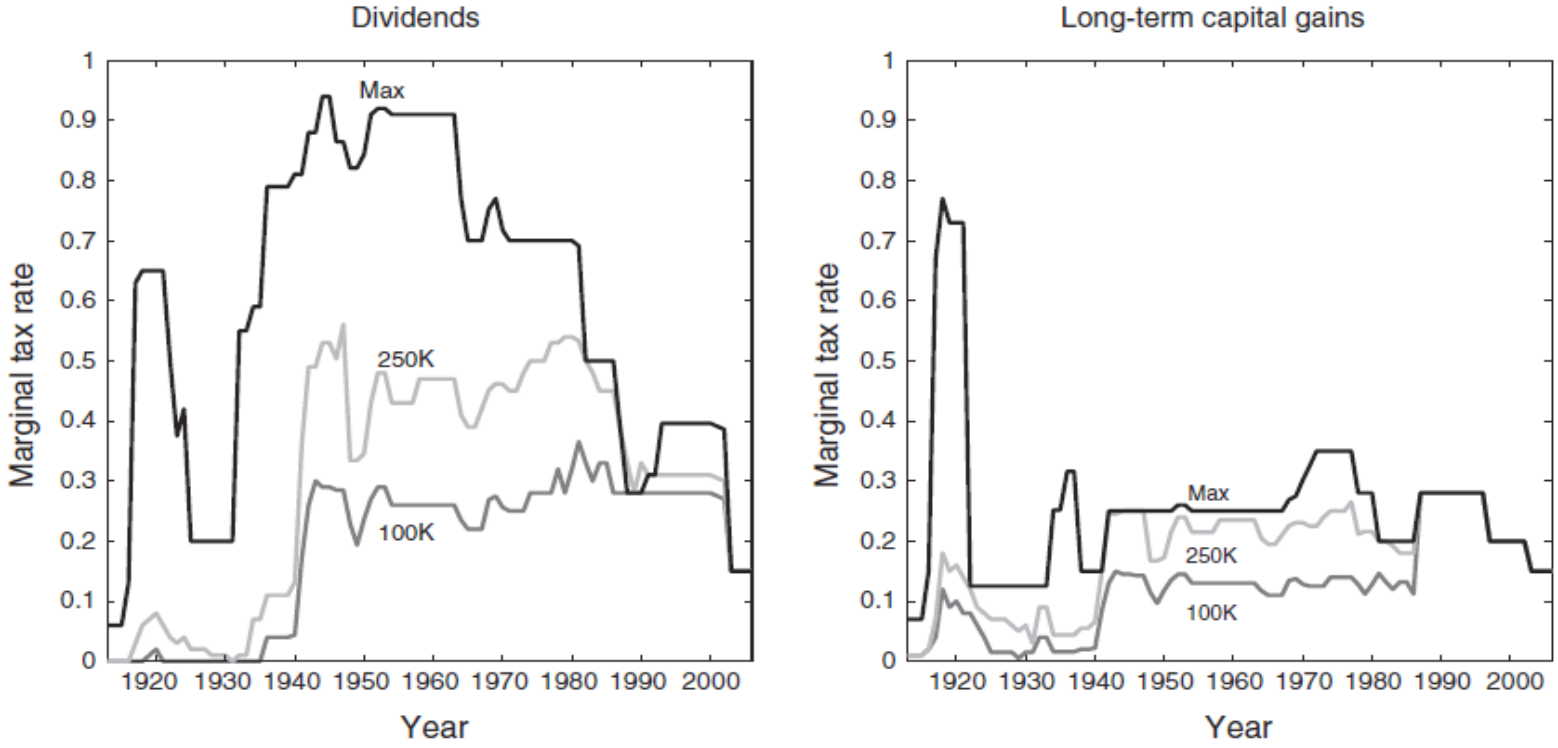


FIGURE 1. STATUTORY FEDERAL MARGINAL DIVIDEND AND LONG-TERM CAPITAL GAINS TAX RATES

Source: Sialm (2009, Figure 1)

BIG CHANGE IN TAXATION IN 2003

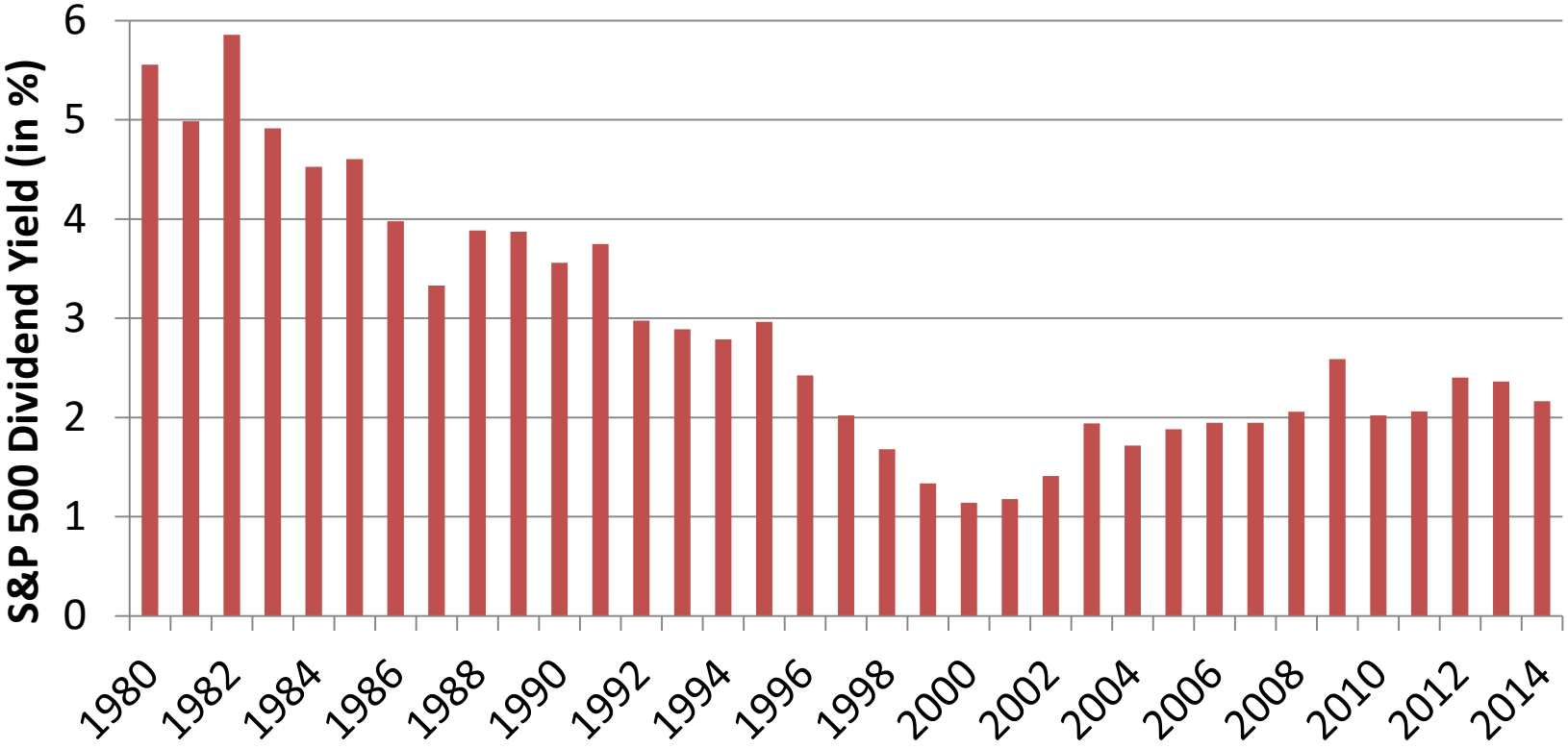
2003 change in taxes in U.S.

Big reduction in tax rate on dividend income (no longer taxed at the same tax rate as labor income and interest)

> Tax rate on long-term capital gains also reduced (but not as much)

Starting in 2013, tax rates on both dividends and long-term capital gains increased from 15% to 23.8% for high-income

DIVIDEND YIELD FOR S&P 500, 1980-2014



Source: Calculations using Robert Shiller Online Data (accessed 2015)

BIG CHANGE IN COMPOSITION OF RETURNS

Average S&P 500 return 12-13% over 1980-2014

Dividend yield has fallen roughly 3/5th over that period (from roughly 5% to roughly 2%)

Thus, reduction in dividend yield has potential to reduce tax liability incurred by taxable investors

DIVIDENDS AND FIRM VALUE

May simply conclude that reducing dividends (and their associated tax liability) would increase firm value

DIVIDENDS AND FIRM VALUE

However, dividends may send a useful signal to investors

Committing to dividends may signal that a firm will not waste resources on bad projects

Committing to dividends can signal that a firm has arrived and expects to be consistently profitable in the future

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Haklai, Y. (2012). *Le Penseur at the California Palace of the Legion of Honor* [Online image]. Retrieved from http://commons.wikimedia.org/wiki/File:Auguste_Rodin-The_Thinker-Legion_of_Honor-Lincoln_Park-San_Francisco.jpg

Sialm, C. (2009). Tax changes and asset pricing. *American Economic Review, 99*(4), 1356-1383.

Shiller, R. (n.d.). Data on S&P 500 Index and dividends. Retrieved in 2015 from http://www.econ.yale.edu/~shiller/data/chapt26.xlsx

INVESTMENTS II: LESSONS & APPLICATIONS FOR INVESTORS

SCOTT WEISBENNER

Fundamentals & Composition of Returns

Realization-Based Capital Gains Tax

REALIZATION-BASED CAPITAL GAINS TAX

TAXATION UPON REALIZATION!

In the U.S., capital gains on assets are only taxed when the asset is sold (not when the gain occurs!)

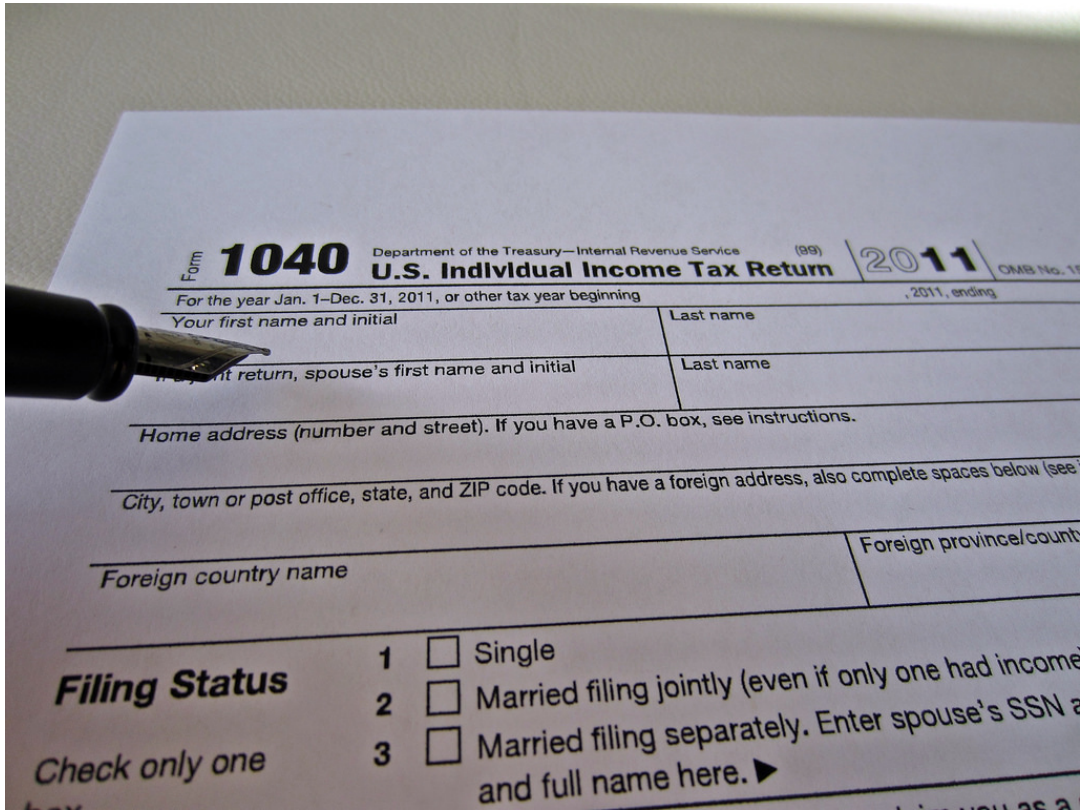
Since 1988, gains realized on assets held for more than a year are often taxed at a lower rate than gains realized on assets held less than a year (this cutoff period has historically also been defined as 6 or 9 months)

TAXATION UPON REALIZATION!

For example, the 2003 tax cut lowered the tax rate on realized long-term capital gains to 15%, while the tax rate on short-term capital gains was 35% (for the highest earners)

These facets of the U.S. tax code allow for tax-timing strategies that can boost returns

TAX-TIMING STRATEGIES



Source: 401(K) 2012 | 401kcalculator.org (2012)

LOSSES VS. GAINS

Even if markets are efficient and there is no skill in picking stocks, can still potentially earn returns through tax-timing strategies

Realize investments with a LOSS within a year of purchase so that deduction is valued at marginal ordinary income tax rate (e.g., 35 or 39.6%)

Realize investments with a GAIN at least a year after purchase (or more) so that gain is taxed at the reduced long-term capital gains rate (e.g., 15 or 23.8%)

DECEMBER 31 IS AN IMPORTANT DATE!

The end of the tax year is December 31 in the U.S.

If realize a gain on December 30 instead of January 2 of next year, will have to pay taxes on that gain a year earlier

If realize a loss on December 30 instead of January 2 of next year, will get the benefit of the tax deduction on that loss a year earlier

DECEMBER 31 IS AN IMPORTANT DATE!

This suggests, if you want to sell a stock, sell stocks with losses before the end of the year, and hold onto stocks with gains until after the start of the new year

TAXES DELAYED ARE TAXES SAVED!

Taxes on labor income, interest income, dividend income, etc. are taxed on an annual basis

Capital gains are taxed on a realization basis

TAXES DELAYED ARE TAXES SAVED!

The “effective” or annual-equivalent capital gains tax rate can be much less than the statutory tax rate on realized capital gains

- Delayed realization of gains
- Basis step-up at death

EXAMPLES OF EFFECTIVE CG TAX RATE

Suppose an asset generates a return of 10% per year

The asset will be held 10 years and the capital gains tax upon realization is 20%

What is the effective annual capital gains tax (***tax***) that would make you indifferent between the realization-base tax and the annual tax?

$$[(1+0.1)^{10} - 1]*(1-0.2) + 1$$

EXAMPLES OF EFFECTIVE CG TAX RATE

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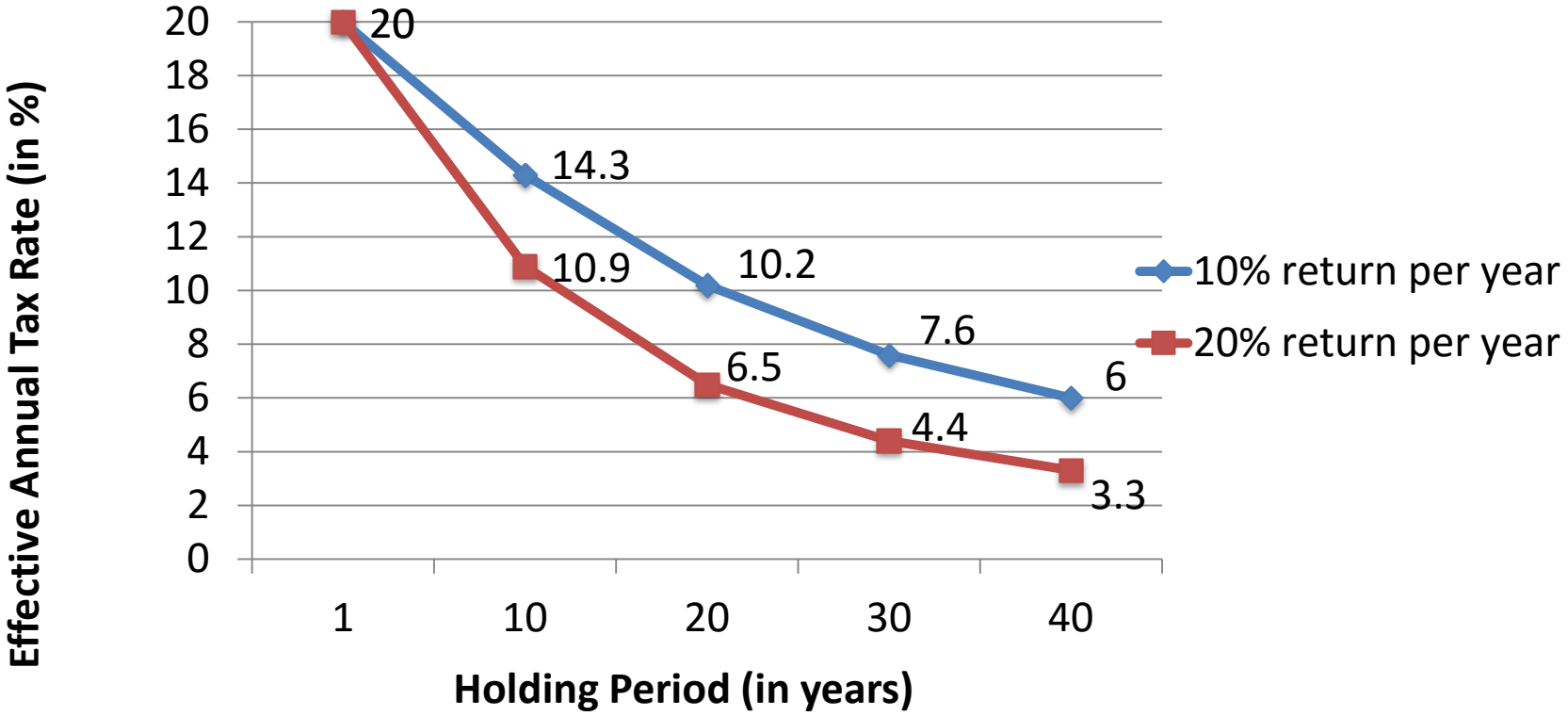
$$[(1+0.1)^{10} - 1]*(1-0.2) + 1 = [1 + r*(1-\textbf{\textit{tax}})]^{10}$$

***tax* = 14.3%**

EFFECTIVE ANNUAL CG TAX RATE (ASSUME 20% REALIZATION TAX RATE)



BASIS STEP-UP AT DEATH

When someone dies, any potential capital gains tax liability on their assets dies with them!

BASIS STEP-UP AT DEATH

Example: Your long-lost uncle has $100,000 in stock with a purchase price of $10,000

If your uncle sells the stock, he pays tax on $90,000 gain

If your uncle dies and bequeaths the stock to you, your basis (or purchase price) is stepped-up to $100,000

Thus, if you sell the stock right when you inherit it you will pay zero capital gains tax!

KEY TAKEAWAYS

Capital gains are taxed on a realization basis in the U.S., often with lower tax rates for long-term gains than short-term gains

The realization-based tax, along with the differential rates, allow for tax-timing strategies that can boost returns

Postponing the realization of capital gains can substantially reduce the effective tax rate (further reduced with basis step-up at death)

STAY TUNED


UPCOMING ATTRACTIONS!
Does Realization-Based Capital Gains Tax
Affect Stock Returns & Sale Decisions
Later in MODULE 1 & MODULE 3

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INVESTMENTS II:
LESSONS & APPLICATIONS FOR INVESTORS

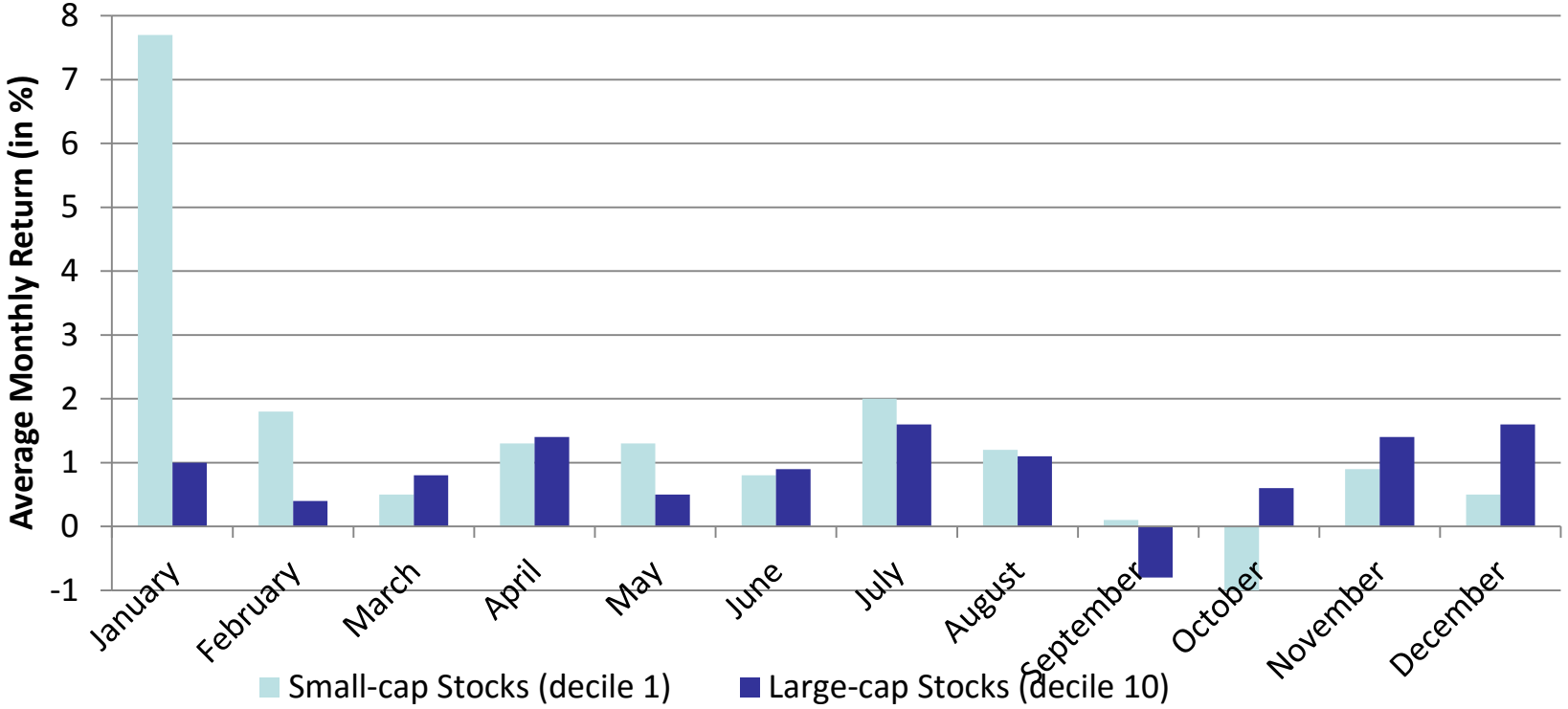
SCOTT WEISBENNER

Fundamentals & Composition of Returns

Seasonality in Stock Returns

IS THERE A SEASONAL PATTERN IN STOCK RETURNS?

SMALL AND LARGE STOCK RETURNS, 1927-2014

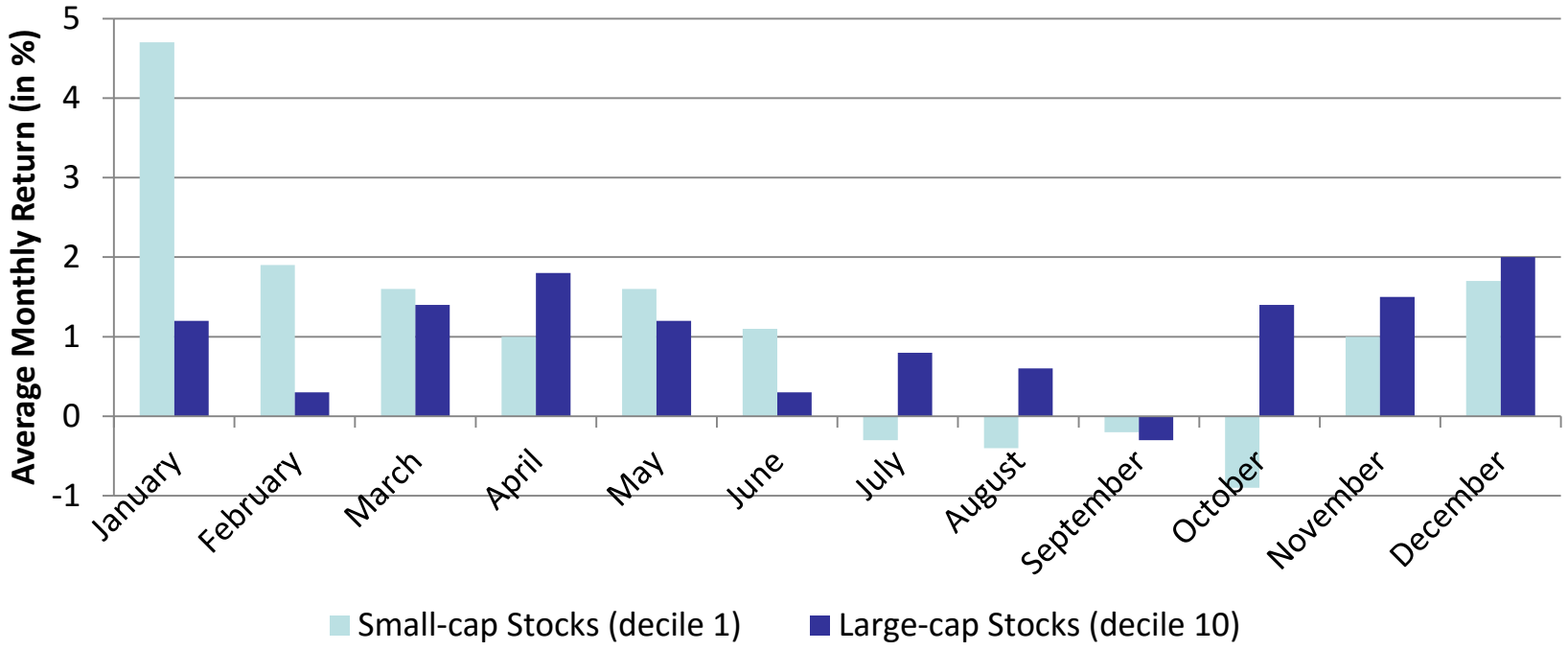


2/5th of average Small-cap Stock return occurs in January over this period

Cannot statistically reject that average Large-cap Stock return is the same across all months

Source: Data retrieved from Kenneth R. French Data Library (accessed 2015)

SMALL AND LARGE STOCK RETURNS, 1982-2014



1/3rd of average Small-cap Stock return occurs in January over this period

Cannot statistically reject that average Large-cap Stock return is the same across all months

Source: Data retrieved from Kenneth R. French Data Library (accessed 2015)

SEASONAL PATTERN IN SMALL STOCK RETURNS

Clearly, returns for small stocks are the highest in January, with a big chunk of their annual return occurring during that month

> This is true even after Banz (1981) and Reinganum (1981) publications about the high returns from small stocks

SEASONAL PATTERN IN SMALL STOCK RETURNS

This pronounced seasonal pattern in returns is not present for large stocks

- Cannot statistically reject that the average monthly return does not vary across the year

REVISITING THE SIZE FACTOR

Now consider the *long-short* strategy of *long* Small-cap Stocks (decile 1) and *short* Large-cap Stocks (decile 10) over the period 1927-2014

The month of January:

CAPM alpha = 6.1%
(highly statistically significant)
CAPM beta = 0.46

Months excluding January:

CAPM alpha = -0.29%
(not statistically significant)
CAPM beta = 0.49

WHY THE HIGH JANUARY RETURNS?

We have identified the famous "January effect"

January return is particularly concentrated in small firms

- Particularly those that had losses during the prior year

WHY THE HIGH JANUARY RETURNS?

The big question is what behavior could be responsible for this seasonal pattern in returns

Two leading hypotheses

- Window dressing by institutional investors
- Tax-loss trading by individual investors

WINDOW-DRESSING HYPOTHESIS

Idea is that institutions may want to avoid reporting having held stocks that have fallen a lot in value

Institutional investors may thus have an incentive to sell losing stocks by the end of a calendar quarter when they need to report their holdings to the SEC

This is particularly true at the end of the calendar year

TAX-LOSS SELLING HYPOTHESIS

Individual investors have an incentive to sell stocks that have fallen in price to realize a capital loss and get a tax deduction

This is particularly true for losses that are short-term status (which has typically been defined as 6 or 12 months since purchase)

TAX-LOSS SELLING HYPOTHESIS

This is also particularly true around the end of the year

- A loss realized December 30 can be used to reduce taxes one year earlier than a loss realized January 2

SIMILAR PREDICTIONS

Both the window-dressing and tax-loss-selling hypothesis have similar predictions

Both predict that there will be selling of stocks with recent losses near the end of December, when this selling pressure stops in early January of the next year, stock prices rise (i.e., high January stock returns)

SIMILAR PREDICTIONS

Any way to distinguish between the two hypotheses?

Institutional ownership is typically higher in large-cap stocks than small-cap stocks, so the January effect being concentrated in small stocks suggests individual tax-motivated behavior may play a larger role than institutional window dressing

Poterba and Weisbenner (2001) exploit changes in capital gains tax rules

EXPLOIT CHANGES IN TAX RULES

Tax Regime	Regime I	Regime II	Regime III
Applicable years	1963–1969, 1988	1970–1976, 1985–1986	1979–1984, 1989–1996
Capital gains tax rules	Six month short-term holding period, long-term losses 100 percent deductible against AGI	Six month short-term holding period, long-term losses 50 percent deductible against AGI	12 month holding period

Changes in the holding period that determine short-term and long-term status should affect individuals for tax purposes but not institutional investors concerned with window dressing

Source: Poterba & Weisbenner (2001, Table 2)

EXPLOIT CHANGES IN TAX RULES

Relate the January return of stocks to the return over the prior January-June and prior July-December

When the short-term holding period is defined as only 6 months, returns over the prior July-December should matter most in predicting December selling and the subsequent January return

When the short-term holding period is defined as 12 months, returns over both the prior July-December and January-June should matter in predicting December selling and the subsequent January return

Under the window-dressing hypothesis, the relation between January returns and past returns should not vary with capital gains tax rules

RELATE JANUARY RETURNS TO PAST PERFORMANCE

Regression of January stock return on firm performance over the prior Jan-June and July-Dec period, LOSS = minimum (0, return) < 0

	Tax Regime I (6 months for ST)	Tax Regime II (6 months for ST)	Tax Regime III (12 months for ST)
$LOSS_{Jan\text{-}June,\ prior\ year}$	-0.084***	-0.053***	-0.068***
$LOSS_{July\text{-}Dec,\ prior\ year}$	-0.143***	-0.151***	-0.086***
Difference in LOSS coefficients	*-0.059****	*-0.097****	*-0.018*
Other controls and firm effects?	Yes	Yes	Yes

*** indicates statistical significance at the 1% level (no stars indicates insignificance)

Source: Poterba & Weisbenner (2001, Table 3)

PAUSE, THINK, AND ANSWER!

Source: Haklai (2012)

QUESTION 1 OF 2

Why has the small-firm January effect declined over time?

QUESTION 2 OF 2

Assuming the effect persists, what type of investor should be buying loser small-cap stocks in December?

DISCUSSION OF QUESTIONS

Why has the small-firm January effect declined over time?

Assuming the effect persists, what type of investor should be buying loser small-cap stocks in December?

KEY TAKEAWAYS

There is a “January effect” in the return of *small stocks*, but not in the *large stocks*

Indeed, the historical higher returns of small stocks relative to large stocks is concentrated in the month of January (and is not present February to December)

KEY TAKEAWAYS

The January effect is larger for stocks that have experienced losses in the prior year and varies with changes in capital gains tax rules

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