Analysis of Retirement Funds

- DATA DIVERSIFIERS -

Jatin   Pratyush

Varalika   Nishant

Kartik   Aryaman

INTRODUCTION

Retirement funds, also known as pension funds, are investment options that allow an individual to save a certain portion of their income for their retirement. These funds offer a regular source of finance after one retires; a retiree receives annuity on their investment until demise. The primary purpose of a retirement savings fund is to create a steady source of revenue for an investor when he or she does not have a source of income.

Categorical Variables:

❑ *Market Capitalization:*
Market capitalization refers to the total dollar market value of a company's outstanding shares of stock. Commonly referred to as "market cap," it is calculated by multiplying the total number of a company's outstanding shares by the current market price of one share.

❑ *Types of funds*:

• **Growth Funds**: A growth fund is a diversified portfolio of stocks that has capital appreciation as its primary goal, with little or no dividend payouts. The portfolio mainly consists of companies with above-average growth that reinvest their earnings into expansion, acquisitions, and/or research and development (R&D).

• **Value funds**: A value fund is a fund that follows a value investing strategy and seeks to invest in stocks that are deemed to be undervalued in price based on fundamental characteristics. Value investing is often compared with growth investing, which focuses on emerging companies with high growth prospects.

❑ *Risk:*
Risk is defined in financial terms as the chance that an outcome or investment's actual gains will differ from an expected outcome or return. Risk includes the possibility of losing some or all of an original investment.

❑ *Star Rating:*
The Morningstar Rating is a measure of a fund's risk-adjusted return, relative to similar funds. Funds are rated from 1 to 5 stars, with the best performers receiving 5 stars and the worst performers receiving a single star.

Numerical Variables:

❏ *Returns to Investment:*
A return, is the money made or lost on an investment over some period of time. A return can be expressed nominally as the change in dollar value of an investment over time, it can also be expressed as a percentage derived from the ratio of profit to investment.

❏ *Expense ratio:*
The expense ratio measures how much of a fund's assets are used for administrative and other operating expenses. An expense ratio is determined by dividing a fund's operating expenses by the average dollar value of its assets under management.

❏ *Assets*
It is a resource with economic value that an individual, corporation, or country owns or controls with the expectation that it will provide a future benefit. An asset can be thought of as something that, in the future, can generate cash flow, reduce expenses, or improve sales, regardless of whether it's manufacturing equipment or a patent.

❏ *Turnover ratio*
The turnover ratio or turnover rate is the percentage of a mutual fund or other portfolio's holdings that have been replaced in a given year.

❏ *Standard Deviation:*
It is a statistic that measures the dispersion of a dataset relative to its mean and is calculated as the square root of the variance. If the data points are further from the mean, there is a higher deviation within the data set; thus, the more spread out the data, the higher the standard deviation.

❏ *Sharpe ratio:*
The Sharpe ratio is used to help investors understand the return of an investment compared to its risk.

Tests:

❏ *F Test:*

An F-test is any statistical test in which the test statistic has an F-distribution under the null hypothesis. It is most often used when comparing statistical models that have been fitted to a data set, in order to identify the model that best fits the population from which the data were sampled.

❏ *T Test:*

A t-test is a type of inferential statistic used to determine if there is a significant difference between the means of two groups, which may be related in certain features. A t-test is used as a hypothesis testing tool, which allows testing of an assumption applicable to a population.

OBJECTIVES

To help the client analyse and invest in funds, we can analyse the following points-

- Which funds are better for short term investment?
- Which funds are better in long term investment?
- Do High Risk funds always yield high returns to investment?
- Does high returns in short term guarantee high returns in Long Term for the same funds ?
- Checking Claim about mean 1 YR return percentage

TEST OF NORMALITY BEFORE CONDUCTING T TESTS

On the basis of closeness of Mean and Median values, we find that the following samples' Populations have normal distributions:

- SD
- Sharpe Ratio
- 1YrReturn%
- 3YrReturn%
- 5YrReturn%
- 10YrReturn%
- Expense Ratio

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	*Assets*			*Turnover Ratio(%)*			*SD*			*Sharpe Ratio*			*Expense Ratio*	
2														
3	Mean	2055.81939		Mean	71.802457		Mean	11.3940786		Mean	1.32464373		Mean	1.22562654
4	Standard Err	335.941356		Standard Err	4.43654331		Standard Err	0.08772036		Standard Err	0.01470251		Standard Err	0.0157271
5	Median	413.11		Median	51		Median	11.02		Median	1.35		Median	1.2
6	Mode	97.16		Mode	57		Mode	10.8		Mode	1.54		Mode	1.25
7	Standard De	6777.36188		Standard De	89.5038939		Standard De	1.76969162		Standard De	0.29661192		Standard De	0.31728224
8	Sample Vari	45932634.1		Sample Vari	8010.94702		Sample Vari	3.13180845		Sample Vari	0.08797863		Sample Vari	0.10066802
9	Kurtosis	148.36798		Kurtosis	24.9281092		Kurtosis	1.34329659		Kurtosis	0.44356921		Kurtosis	2.63300862
10	Skewness	10.7120498		Skewness	4.53400196		Skewness	0.87916145		Skewness	-0.5764122		Skewness	1.02807731
11	Range	106832.1		Range	689		Range	12.73		Range	1.74		Range	2.42
12	Minimum	5.21		Minimum	0		Minimum	6.4		Minimum	0.17		Minimum	0.29
13	Maximum	106837.31		Maximum	689		Maximum	19.13		Maximum	1.91		Maximum	2.71
14	Sum	836718.493		Sum	29223.6		Sum	4637.39		Sum	539.13		Sum	498.83
15	Count	407		Count	407		Count	407		Count	407		Count	407
16														
17	*1YrReturn%*			*3YrReturn%*			*5YrReturn%*			*10YrReturn%*				
18														
19	Mean	7.81353808		Mean	15.1457985		Mean	14.3032678		Mean	7.58211302			
20	Standard Err	0.2696242		Standard Err	0.14848578		Standard Err	0.11553888		Standard Err	0.08472592			
21	Median	8.94		Median	15.34		Median	14.55		Median	7.59			
22	Mode	8.97		Mode	14.26		Mode	15.17		Mode	7.47			
23	Standard De	5.43946365		Standard De	2.99558785		Standard De	2.33090912		Standard De	1.70928109			
24	Sample Vari	29.5877648		Sample Vari	8.97354659		Sample Vari	5.43313732		Sample Vari	2.92164183			
25	Kurtosis	1.18303262		Kurtosis	3.56661203		Kurtosis	1.45163544		Kurtosis	2.75276286			
26	Skewness	-0.8961034		Skewness	-0.4630802		Skewness	-0.4431927		Skewness	0.13278147			
27	Range	35.75		Range	29.36		Range	17.77		Range	16.17			
28	Minimum	-14.05		Minimum	1.53		Minimum	5.06		Minimum	0.94			
29	Maximum	21.7		Maximum	30.89		Maximum	22.83		Maximum	17.11			
30	Sum	3180.11		Sum	6164.34		Sum	5821.43		Sum	3085.92			
31	Count	407		Count	407		Count	407		Count	407			

Note: Since the test of our preference 't test' is a robust test, it wouldn't have lost power even if the population departed somewhat from the normal distribution, particularly since the sample size is large enough to enable the test statistic to follow the t distribution

Which funds are better for Short Term Investment and Long Term Investment?

Short Term Investment

Which funds are better for Short Term Investment?

LARGE CAP – VALUE FUNDS performs better than other funds in SHORT TERM INVESTMENT i.e. 1YR to 3 YR .

Why LARGE CAP FUNDS ?

- They give better returns than Small and Mid Cap Funds in Short Term.
- Large-Cap funds are less risky to invest in than Small Cap and Mid Cap Funds.
- They have greater Sharpe Ratio.
- They have lesser Expense Ratio.

Why VALUE FUNDS ?

Growth and Value Funds both gives similar returns in Short Term, however-
- Value Funds are less Risky to invest in.
- Value Funds have greater Sharpe Ratio.

Why Large Cap Funds?

Comparing Large Cap, Mid Cap and Small Cap Market Funds for 1 year Returns to Investment trends

COMPARING LARGE CAP AND SMALL CAP FUNDS FOR 1 YR RETURNS		COMPARING LARGE CAP AND MIDDLE CAP FUNDS FOR 1 YR RETURNS	
F TEST		F TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VLAUE	0.047670531	P VLAUE	0.202581788
REJECT THE NULL HYPOTHESIS		DO NOT REJECT THE NULL HYPOTHESIS	
SEPARATE T TEST		POOLED T TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VALUE	1.31255E-29	P VALUE	3.86845E-10
REJECT THE NULL HYPOTHESIS		REJECT THE NULL HYPOTHESIS	

RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF LARGE CAP & SMALL CAP 1YR RETURNS	RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF LARGE CAP & MIDDLE CAP 1YR RETURNS
CONCLUSION- LARGE CAP FUNDS give better RETURNS than SMALL CAP FUNDS in 1YR	CONCLUSION- LARGE CAP FUNDS give better RETURNS than MIDDLE CAP FUNDS in 1YR

COMBINED CONCLUSION - LARGE CAP FUNDS give better RETURNS than other two funds in 1 YR

Comparing Large Cap, Mid Cap and Small Cap Market funds for 3 year Returns to Investment trends

COMPARING LARGE CAP AND SMALL CAP FUNDS FOR 3 YR RETURNS		COMPARING LARGE CAP AND MIDDLE CAP FUNDS FOR 3 YR RETURNS	
F TEST		F TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VLAUE	0.18501297	P VLAUE	0.01267
DO NOT REJECT THE NULL HYPOTHESIS		REJECT THE NULL HYPOTHESIS	
POOLED T TEST		POOLED T TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VALUE	5.28393E-09	P VALUE	0.069924
REJECT THE NULL HYPOTHESIS		DO NOT REJECT THE NULL HYPOTHESIS	
RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF LARGE CAP & SMALL CAP 3YR RETURNS		RESULT- NO SIGNIFICANT DIFFERENCE BETWEEN MEAN OF LARGE CAP & MIDDLE CAP 3YR RETU	
CONCLUSION- LARGE CAP FUNDS give better RETURNS than SMALL CAP FUNDS in 3YR		CONCLUSION- LARGE CAP FUNDS & MIDDLE CAP FUNDS both give similar RETURNS in 3YR	

COMBINED CONCLUSION - LARGE CAP FUNDS & MIDDLE CAP FUNDS give similar return but better than SMALL CAP FUNDS in 3 YR

RESULTS from above F test & T test

LARGE CAP FUNDS give better Returns than Small Cap and Mid Cap Funds in Short Term Investment i.e. 1YR & 3YR

TYPE	Average of 1YrReturn%	Average of 3YrReturn%
Large	10.4462381	15.751
Mid-Cap	7.376134454	15.11806723
Small	1.392820513	13.55871795
Grand Total	**7.813538084**	**15.14579853**
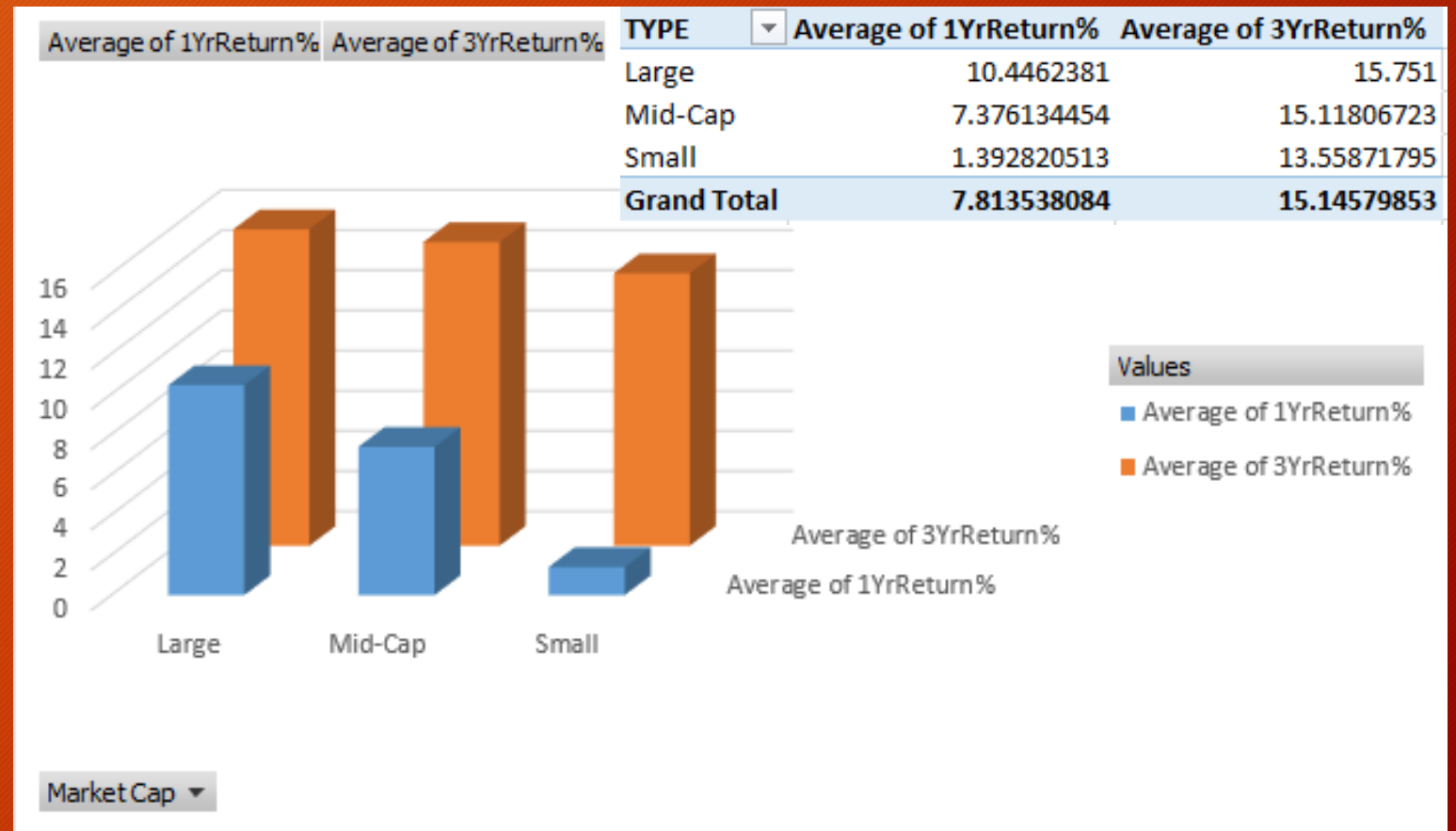
Comparing Large Cap, Mid Cap and Small Cap market funds to analyse Standard Deviation trends

COMPARING SMALL CAP AND MIDDLE CAP FUNDS FOR STANDARD DEVIATION		COMPARING MIDDLE CAP AND LARGE CAP FUNDS FOR STANDARD DEVIATION	
F TEST		F TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VLAUE	0.226959438	P VLAUE	0.06874157
DO NOT REJECT THE NULL HYPOTHESIS		DO NOT REJECT THE NULL HYPOTHESIS	
POOLED T TEST		POOLED T TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VALUE	8.89126E-15	P VALUE	1.4193E-45
REJECT THE NULL HYPOTHESIS		REJECT THE NULL HYPOTHESIS	
RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF SMALL CAP AND MIDDLE CAP SD		RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF LARGE CAP & MIDDLE CAP SD	
CONCLUSION- MIDDLE CAP FUNDS ARE LESS RISKY THAN SMALL CAP FUNDS		CONCLUSION- LARGE CAP FUNDS ARE LESS RISKY THAN MIDDLE CAP FUNDS	

COMBINED CONCLUSION - LARGE CAP FUNDS ARE LEAST RISKY TO INVEST IN and followed by MIDDLE CAP and SMALL CAP FUNDS

STANDARD DEVIATION   ----   Large Cap < Middle Cap < Small Cap

Comparing Large Cap, Mid Cap and Small Cap market funds to analyse Sharpe Ratio trends

COMPARING SMALL CAP AND MIDDLE CAP FUNDS FOR SHARPE RATIO		COMPARING MIDDLE CAP AND LARGE CAP FUNDS FOR SHARPE RATIO	
F TEST		F TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VLAUE	0.583066837	P VLAUE	0.036099805
DO NOT REJECT THE NULL HYPOTHESIS		REJECT THE NULL HYPOTHESIS	
POOLED T TEST		SEPARATE T TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VALUE	2.03281E-12	P VALUE	4.05291E-08
REJECT THE NULL HYPOTHESIS		REJECT THE NULL HYPOTHESIS	
RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF SMALL CAP & MIDDLE CAP SHARPE RATIO		RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF LARGE CAP & MIDDLE CAP SHARPE RATIO	
CONCLUSION- MIDDLE CAP FUNDS have greater SHARPE RATIO than SMALL CAP FUNDS		CONCLUSION- LARGE CAP FUNDS have greater SHARPE RATIO than MIDDLE CAP FUNDS	

COMBINED CONCLUSION - LARGE CAP FUNDS have greater SHARPE RATIO than other two funds

SHARPE RATIO   ----   Large Cap > Middle Cap > Small Cap

Comparing Large Cap, Mid Cap and Small Cap market funds to analyse Expense Ratio trends

| COMPARING SMALL CAP AND MIDDLE CAP FUNDS FOR EXPENSE RATIO		COMPARING MIDDLE CAP AND LARGE CAP FUNDS FOR EXPENSE RATIO	
F TEST		F TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VLAUE	0.413149925	P VLAUE	0.1663728
DO NOT REJECT THE NULL HYPOTHESIS		DO NOT REJECT THE NULL HYPOTHESIS	
POOLED T TEST		POOLED T TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VALUE	5.96383E-05	P VALUE	6.646E-06
REJECT THE NULL HYPOTHESIS		REJECT THE NULL HYPOTHESIS	
RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF SMALL CAP & MIDDLE CAP EXPENSE RATIO		RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF LARGE CAP & MIDDLE CAP EXPENSE RATI	
CONCLUSION- MIDDLE CAP FUNDS have LESSER EXPENSE RATIO than SMALL CAP FUNDS		CONCLUSION- LARGE CAP FUNDS have LESSER EXPENSERATIO than MIDDLE CAP FUNDS	

COMBINED CONCLUSION - LARGE CAP FUNDS have LESSER EXPENSE RATIO than other two funds

EXPENSE RATIO   ----   Large Cap < Middle Cap < Small Cap

RESULTS from above F tests & T tests

1. Large Cap Funds are less Volatile (Risky) to invest in, as it has least Standard Deviation.
2. Large Cap Funds have greater Sharpe Ratio than other two funds.
3. Large Cap Funds have lesser Expense Ratio than other two funds.

| Average of SD | Average of Sharpe Ratio | Average of Expense Ratio |
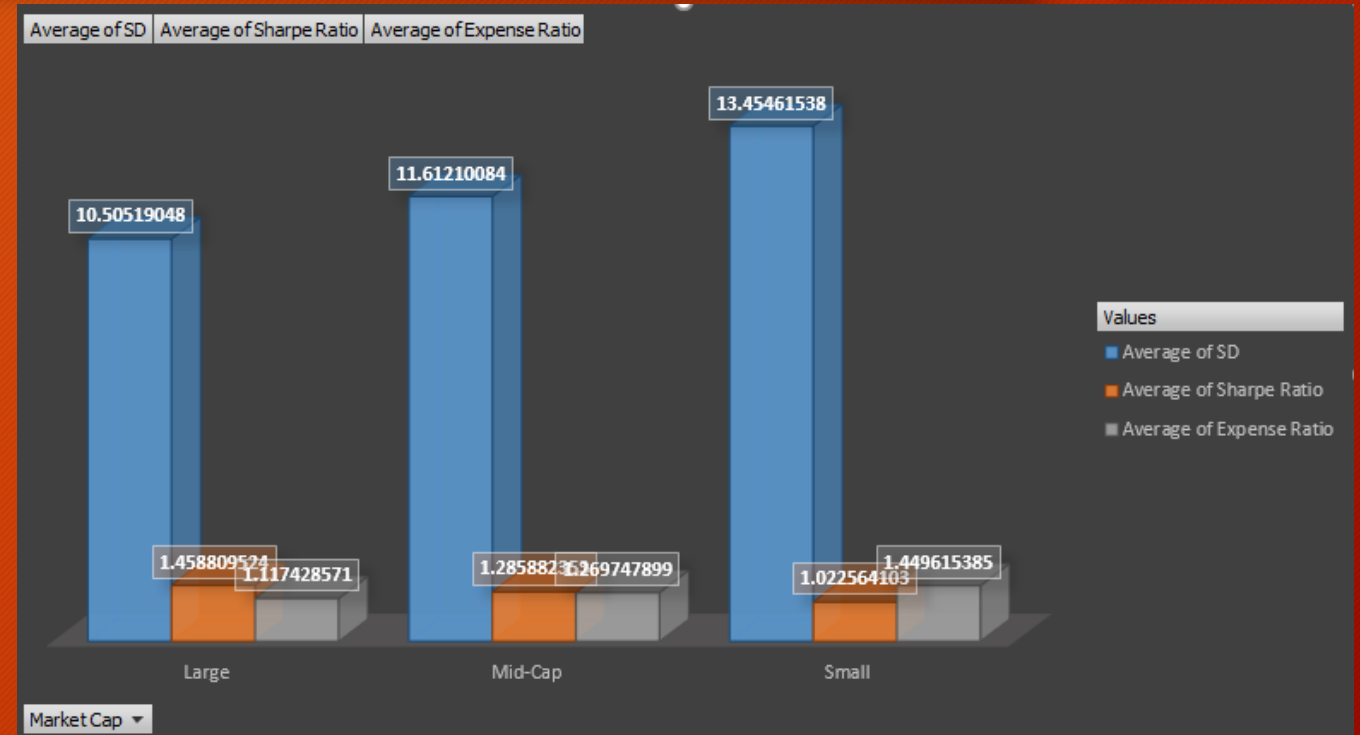
TYPE	Average of SD	Average of Sharpe Ratio	Average of Expense Ratio
Large	10.50519048	1.458809524	1.117428571
Mid-Cap	11.61210084	1.285882353	1.269747899
Small	13.45461538	1.022564103	1.449615385
Grand Total	11.39407862	1.324643735	1.225626536

Why Value Funds?

Comparing Value Funds and Growth Funds for 1YR and 3YR return

COMPARING GROWTH AND VALUE FUNDS FOR 1 YEAR RETURN %

F TEST

Level of Significance	0.05
p-Value	0.1604

Don't reject the null hypothesis

POOLED T TEST

Level of Significance	0.05
p-Value	0.0911

Don't reject the null hypithesis

RESULT-NO SIGNIFICANT DIFFERNCE BETWEEN MEAN 1 YEAR RETURN % FOR GROWTH AND VALUE FUNDS

CONCLUSION-BOTH GROWTH AND A VALUE FUNDS PROVIDE SIMILAR MEAN 1 YEAR RETURN %

COMPARING GROWTH AND VALUE FUNDS FOR 3 YEAR RETURN %

F TEST

Level of Significance	0.05
p-Value	0.0029

Reject the null hypothesis

SEPARATE VARIANCE T TEST

Level of Significance	0.05
p-Value	0.98570936

Don't reject the null hypithesis

RESULT-NO SIGNIFICANT DIFFERNCE BETWEEN MEAN 3 YEAR RETURN % FOR GROWTH AND VALUE FUNDS

CONCLUSION-BOTH GROWTH AND A VALUE FUNDS PROVIDE SIMILAR MEAN 3 YEAR RETURN %

Average RETURN%

BOTH GROWTH FUNDS and VALUE FUNDS give similar RETURNS in Short Term Investment i.e. 1YR and 3 YR

Comparing GROWTH FUNDS and VALUE FUNDS for Standard Deviation

COMPARING GROWTH AND VALUE FUNDS FSTANDARD DEVIATION

F TEST
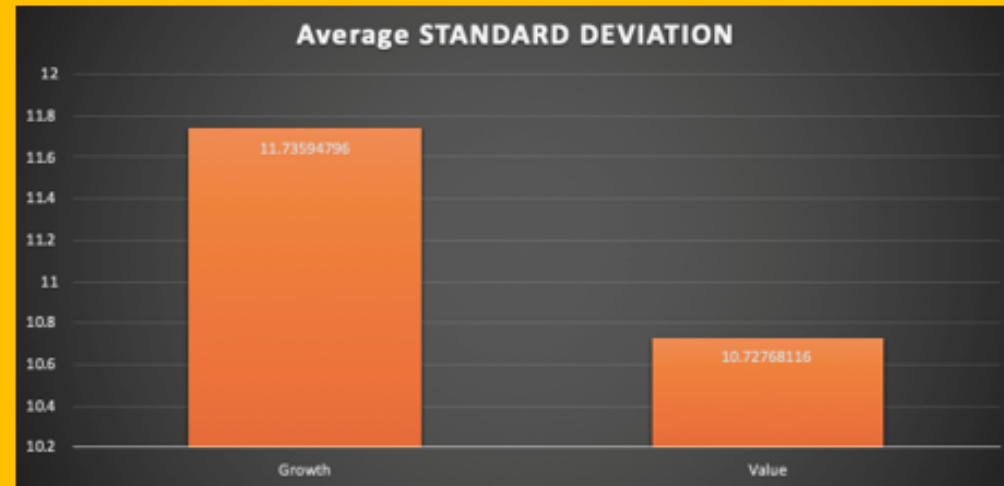Level of Significance   0.05
p-Value   0.055
    Don't reject the null hypothesis

POOLED T TEST
Level of Significance   0.05
p-Value   3.1245E-08
    Reject the null hypothesis

Average STANDARD DEVIATION

Growth: 11.73594796
Value: 10.72768116

RESULT-THERE IS SIGNIFICANT DIFFERNCE BETWEEN MEAN STANDARD DEVIATION OF GROWTH AND VALUE FUNDS
CONCLUSION- GROWTH FUNDS HAVE SIGNIFICANTLY DIFFERENT STANDARD DEVIATIONS THAN VALUE FUNDS
COMBINED CONCLUSION-GROWTH FUNDS HAVE SIGNIFICANTLY HIGHER STANDARD DEVIATIONS THAN VALUE FUNDS

RESULT – Value Funds are Less Volatile (Risky) than Growth Funds as Growth Funds have greater Standard Deviation.

Comparing GROWTH FUNDS and VALUE FUNDS for Sharpe Ratio

COMPARING GROWTH AND VALUE FUNDS FOR SHARPE RATIO

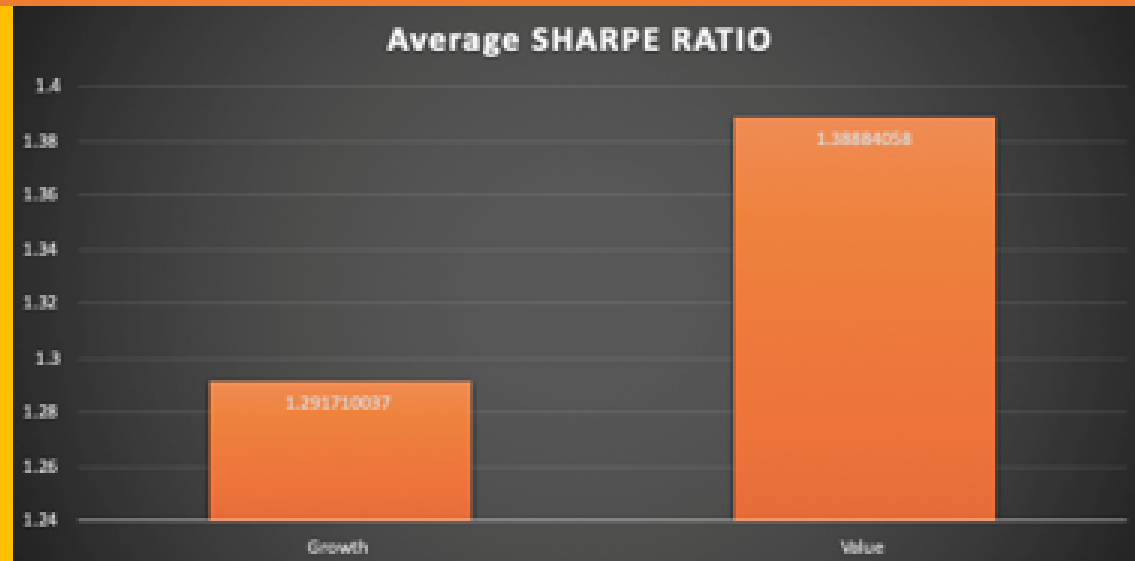F TEST

Level of Sign   0.05

p-Value   0.3722

n't reject the null hypothe:

POOLED T TEST

Level of Sign   0.05

p-Value   0.0016855

Reject the null hypothesis

Average SHARPE RATIO

Growth: 1.291710037

Value: 1.38884058

RESULT-THERE IS   SIGNIFICANT DIFFERNCE BETWEEN MEAN SHARPE RATIOS FOR GROWTH AND VALUE FUNDS

CONCLUSION- GROWTH FUNDS HAVE SIGNIFICANTLY DIFFERENT MEAN SHARPE RATIOS THAN VALUE FUNDS

COMBINED CONCLUSION-GROWTH FUNDS HAVE SIGNIFICANTLY LOWER MEAN SHARPE RATIOS THAN VALUE FUNDS

RESULT – Value Funds have greater Sharpe Ratio than Growth Funds.

Long Term Investment

Which funds are better for Long Term Investment?

MID CAP – GROWTH FUNDS performs better than other funds on the basis of RETURNS in LONG TERM INVESTMENT i.e. 5 YR to 10 YR .

Why MID CAP FUNDS ?

- Mid-Cap Funds give better returns than Small and Large Cap Funds in Long Term.

Why GROWTH FUNDS ?

- Growth Funds provide significantly better Returns to Investment in the Long Term, i.e., 5 year and 10 year.

Why Mid-Cap Funds ?

Comparing Large Cap, Mid Cap and Small Cap market funds for 5 year Returns to Investment trends

COMPARING MIDDLE CAP AND LARGE CAP FUNDS FOR 5 YR RETURNS		COMPARING MIDDLE CAP AND SMALL CAP FUNDS FOR 5 YR RETURNS	
F TEST		F TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VLAUE	0.36303	P VLAUE	0.031439
DO NOT REJECT THE NULL HYPOTHESIS		REJECT THE NULL HYPOTHESIS	
POOLED T TEST		SEPARATE T TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VALUE	0.001197	P VALUE	0.097638
REJECT THE NULL HYPOTHESIS		DO NOT REJECT THE NULL HYPOTHESIS	
RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF MIDDLE CAP & LARGE CAP 5YR RETURNS		RESULT- NO SIGNIFICANT DIFFERENCE BETWEEN MEAN OF LARGE CAP & MIDDLE CAP 5YR RETU	
CONCLUSION- MIDDLE CAP FUNDS give better RETURNS than LARGE CAP FUNDS in 5YR		CONCLUSION- MIDDLE CAP & SMALL CAP BOTH FUNDS give similar RETURNS in 5 YR	

COMBINED CONCLUSION - MIDDLE CAP & SMALL CAP BOTH FUNDS give similar RETURNS but greater than LARGE CAP FUNDS in 5YR

Comparing Large Cap, Mid Cap and Small Cap market funds for 10 year Returns to Investment trends

COMPARING MIDDLE CAP AND LARGE CAP FUNDS FOR 10 YR RETURNS		COMPARING MIDDLE CAP AND SMALL CAP FUNDS FOR 10 YR RETURNS	
F TEST		F TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VLAUE	0.479150489	P VLAUE	0.360047
DO NOT REJECT THE NULL HYPOTHESIS		DO NOT REJECT THE NULL HYPOTHESIS	
POOLED T TEST		POOLED T TEST	
LEVEL OF SIGNIFICANCE	0.05	LEVEL OF SIGNIFICANCE	0.05
P VALUE	1.66586E-05	P VALUE	0.002204
REJECT THE NULL HYPOTHESIS		REJECT THE NULL HYPOTHESIS	

RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF MIDDLE CAP & LARGE CAP 10YR RETURNS

RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF LARGE CAP & MIDDLE CAP 10YR RETURN

CONCLUSION- MIDDLE CAP FUNDS give better RETURNS than LARGE CAP FUNDS in 10YR
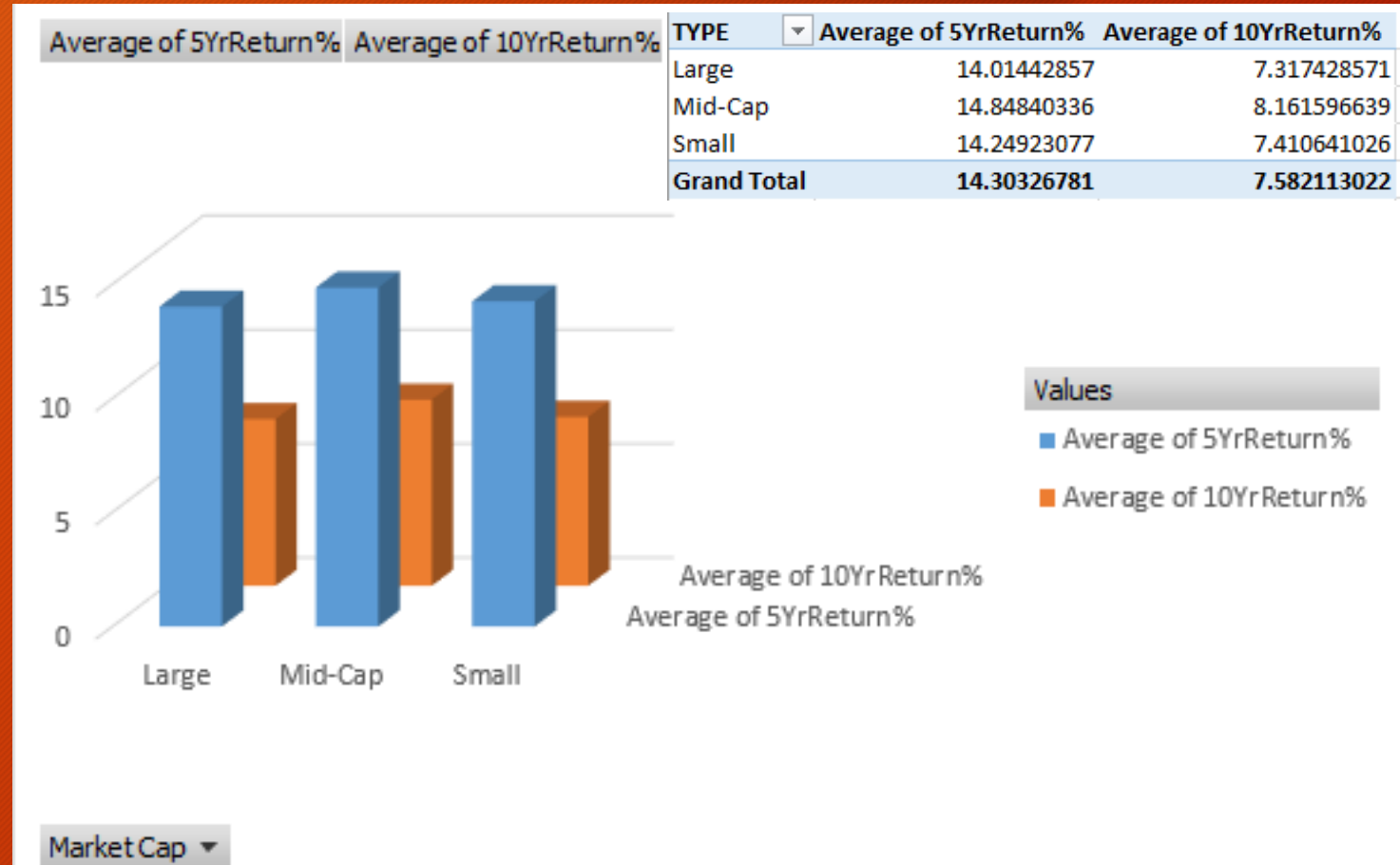
CONCLUSION- MIDDLE CAP FUNDS give better RETURNS than SMALL CAP FUNDS in 10YR

COMBINED CONCLUSION - MIDDLE CAP FUNDS give better RETURNS than other two funds in 10YR

Results from the T-Test and F-Tests

MID CAP FUNDS give better Returns than Small Cap and Large Cap Funds in Long Term Investment i.e. 5 YR & 10 YR

TYPE	Average of 5YrReturn%	Average of 10YrReturn%
Large	14.01442857	7.317428571
Mid-Cap	14.84840336	8.161596639
Small	14.24923077	7.410641026
Grand Total	**14.30326781**	**7.582113022**

Why Growth Funds?

Comparing Value Funds and Growth Funds for 5YR and 10YR return

COMPARING GROWTH AND VALUE FUNDS FOR 5 YEAR RETURN %

F TEST

Level of Signif	0.05
p-Value	0.7237

DON'T Reject the null hypothesis

POOLED T TEST

Level of Signif	0.05
p-Value	1.71019E-07

Reject the null hypithesis

RESULT-THERE IS SIGNIFICANT DIFFERNCE BETWEEN MEAN 5 YEAR RETURN % FOR GROWTH AND VALUE FUNDS

CONCLUSION- GROWTH FUNDS PROVIDE SIGNIFICANTLY BETTER MEAN 3 YEAR RETURN % THAN VALUE FUNDS
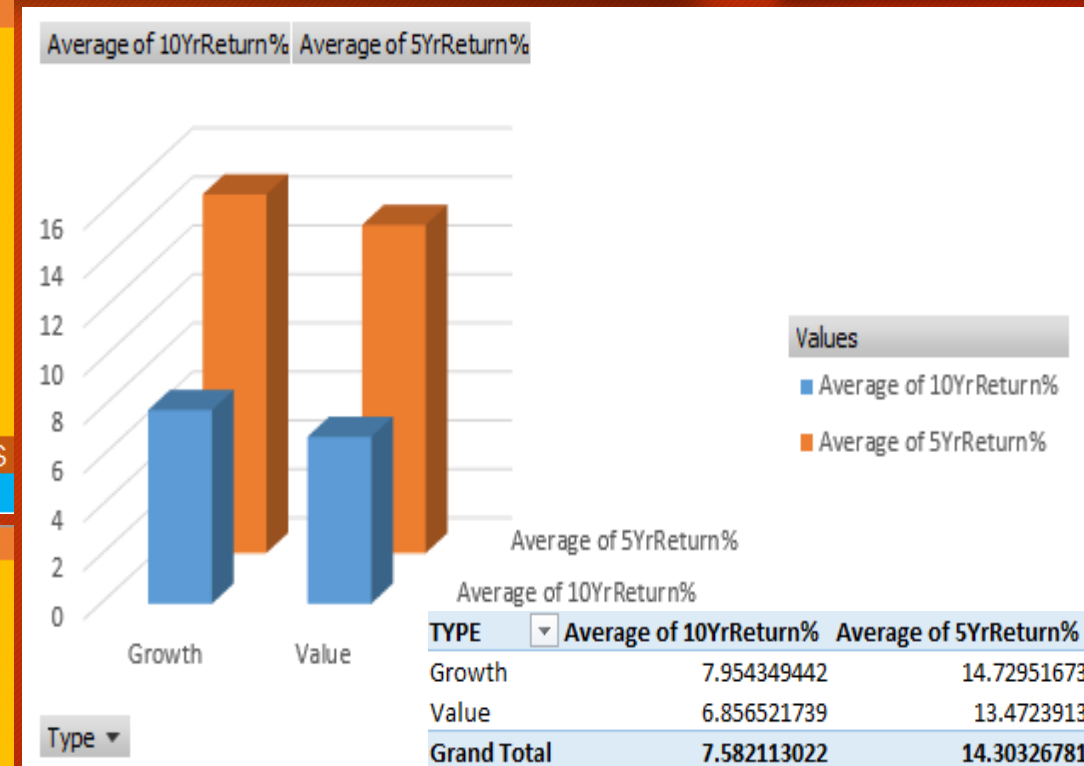
COMPARING GROWTH AND VALUE FUNDS FOR 10 YEAR RETURN %

F TEST

Level of Significance	0.05
p-Value	0.0583

Don't reject the null hypothesis

POOLED T TEST

Level of Significance	0.05
p-Value	3.5627E-10

Reject the null hypithesis

RESULT-THERE IS SIGNIFICANT DIFFERNCE BETWEEN MEAN 10 YEAR RETURN % FOR GROWTH AND VALUE FUNDS

CONCLUSION- GROWTH FUNDS PROVIDE SIGNIFICANTLY BETTER MEAN 10 YEAR RETURN % THAN VALUE FUNDS

Average of 10YrReturn% Average of 5YrReturn%

Values
- Average of 10YrReturn%
- Average of 5YrReturn%

Average of 5YrReturn%
Average of 10YrReturn%

TYPE	Average of 10YrReturn%	Average of 5YrReturn%
Growth	7.954349442	14.72951673
Value	6.856521739	13.4723913
Grand Total	7.582113022	14.30326781

Growth Funds provide significantly better Returns to Investment in the Long Term, i.e., 5 year and 10 year.

However...

Despite better Returns in Long Run,Growth Funds are more Risky than Value Funds and Mid-Cap funds are more risky than large-cap funds.

SO,WHATS THE NEXT OPTION ???

However on further analysis, we found that Large Cap Value Funds are safe to invest in for Long Term Investment but give Lesser Returns.

How Large Cap – Value Funds are SAFE to invest in Long term?

Large Cap – Value Funds show Lesser Standard Deviation and Larger Sharpe Ratio
Therefore, Large Cap – Value Funds are less Risky to invest in and yield better returns on risk.
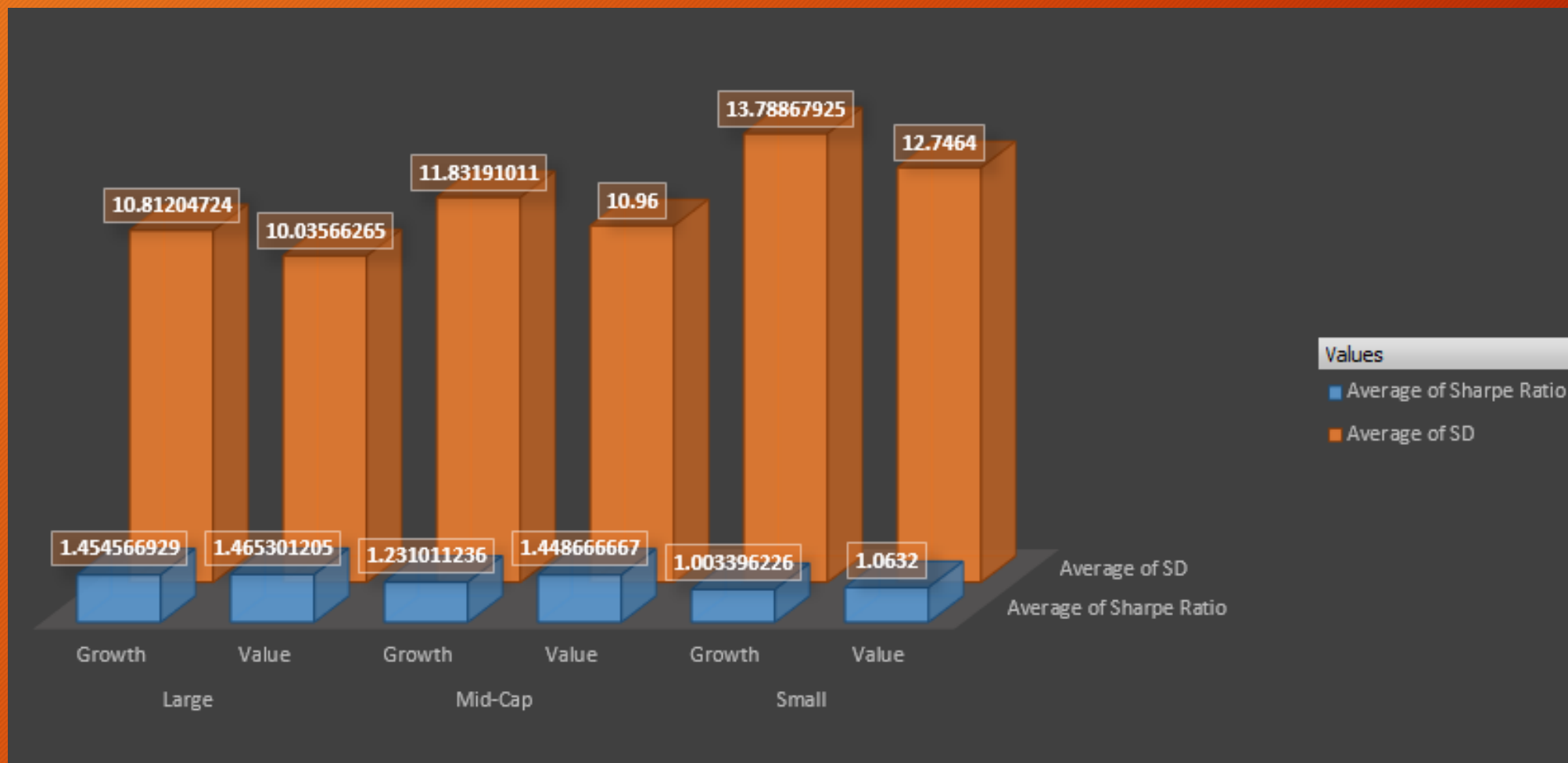
In the long run, client faces trade-off between Low Risk and High Return

Do High Risk funds always yield high returns to investment?

In this section, we assess the validity of the conclusion we have made in the last section that in order to gain High Returns in Long Run one must take Higher Risk.

Now we use Hypothesis Testing to see whether the difference in Average return percentages are actually Significant in the different RISK categories or not.

1 Year Returns to Investment

COMPARING HIGH RISK AND LOW RISK FUNDS FOR 1 YR RETURNS

F TEST

LEVEL OF SIGNIFICANCE	0.05000
P VLAUE	0.00001

REJECT THE NULL HYPOTHESIS

SEPARATE T TEST

LEVEL OF SIGNIFICANCE	0.05000
P VALUE	0.00000

REJECT THE NULL HYPOTHESIS

RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF HIGH RISK & LOW RISK 1YR RETURNS

CONCLUSION- LOW RISK FUNDS GIVES BETTER RETURNS THAN HIGH IN 1YR

COMPARING LOW RISK AND AVERAGE RISK FUNDS FOR 1 YR RETURNS

F TEST

LEVEL OF SIGNIFICANCE	0.05000
P VLAUE	0.00200

REJECT THE NULL HYPOTHESIS

SEPARATE T TEST

LEVEL OF SIGNIFICANCE	0.05000
P VALUE	0.00005

REJECT THE NULL HYPOTHESIS

RESULT- SIGNIFICANT DIFFERENCE BETWEEN MEAN OF LOW RISK & AVERAGE RISK 1YR RETURNS

CONCLUSION- LOW RISK FUNDS GIVE BETTER RETURNS THAN AVERAGE RISK FUNDS IN 1YR

CONCLUSION- The low risk funds give best return in 1 year time frame followed by average risk and high risk respectively.

3 Year Returns to Investment

COMPARING HIGH RISK AND LOW RISK FUNDS FOR 3 YR RETURNS

F TEST

LEVEL OF SIGNIFICANCE	0.05000
P VLAUE	0.00127

REJECT THE NULL HYPOTHESIS

SEPARATE T TEST

LEVEL OF SIGNIFICANCE	0.05000
P VALUE	0.25584

CANNOT REJECT THE NULL HYPOTHESIS

RESULT- THERE ISN'T MUCH DIFFERENCE IN HIGH RISK & LOW RISK 3YR RETURNS

CONCLUSION- HIGH RISK AND LOW RISK FUNDS GIVE SIMILAR RETURNS IN 3YR

COMPARING HIGH RISK AND AVERAGE RISK FUNDS FOR 3 YR RETURNS

F TEST

LEVEL OF SIGNIFICANCE	0.05000
P VLAUE	0.00007

REJECT THE NULL HYPOTHESIS

SEPARATE T TEST

LEVEL OF SIGNIFICANCE	0.05000
P VALUE	0.00022

REJECT THE NULL HYPOTHESIS

RESULT- SIGNIFICANT DIFFERENCE IN HIGH RISK & AVERAGE RISK 3YR RETURNS

CONCLUSION- AVERAGE RISK FUNDS GIVE BETTER RETURNS THAN HIGH RISK FUNDS IN 3YR

CONCLUSION- Average risk funds give best return in 3 year time period, whereas there isn't much difference in return between low and high risk funds

The tradeoff between low risk and high return doesn't stand in short term investments
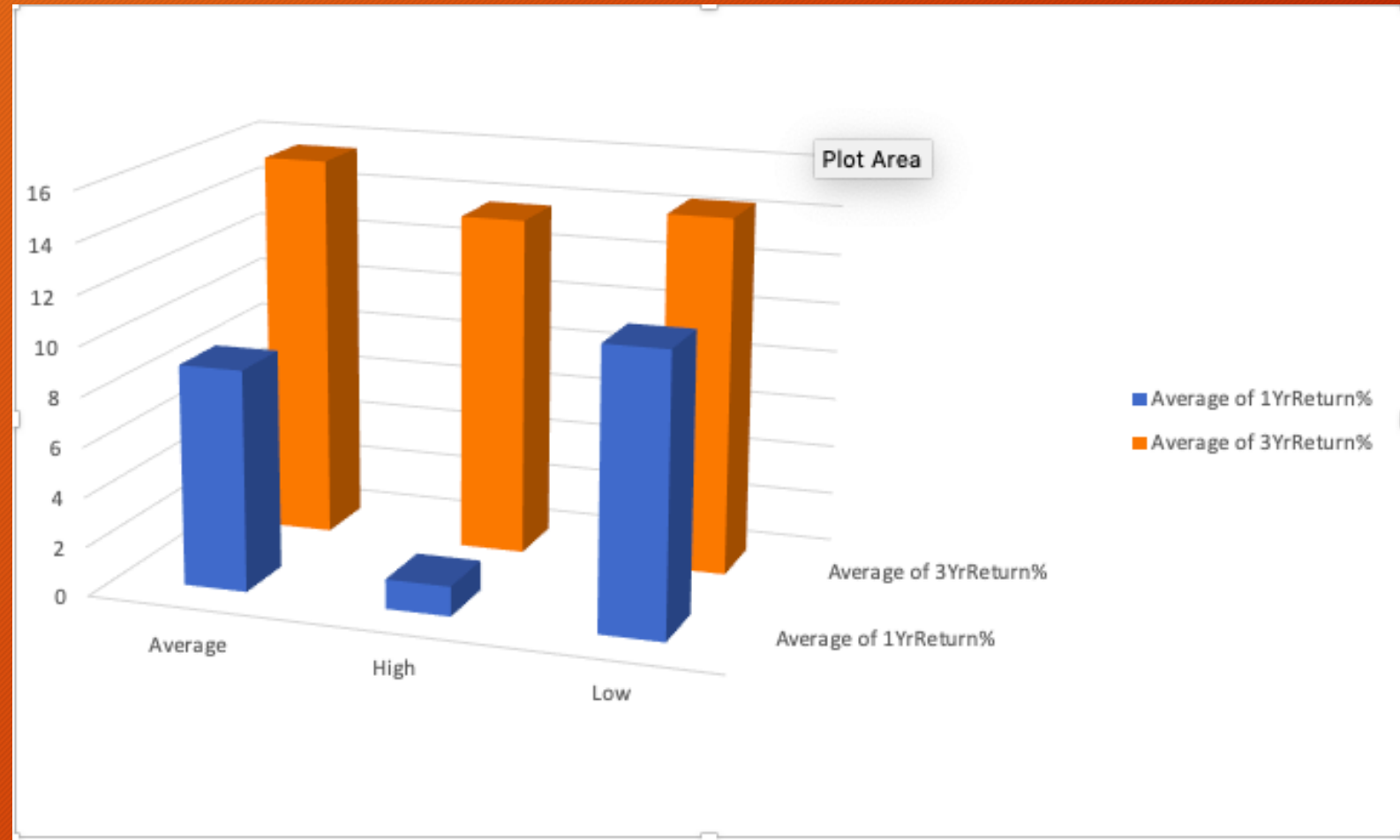
5 Year Returns to Investment

COMPARING HIGH RISK AND LOW RISK FUNDS FOR 5 YR RETURNS

F TEST

LEVEL OF SIGNIFICANCE	0.05000
P VLAUE	0.00123

REJECT THE NULL HYPOTHESIS

SEPARATE T TEST

LEVEL OF SIGNIFICANCE	0.05000
P VALUE	0.05725

CANNOT REJECT THE NULL HYPOTHESIS

RESULT- THERE ISN'T SIGNIFICANT DIFFERENCE IN HIGH RISK & LOW RISK 5YR RETURNS

CONCLUSION- HIGH RISK AND LOW RISK FUNDS GIVE SIMILAR RETURNS IN 5YR

COMPARING HIGH RISK AND AVERAGE RISK FUNDS FOR 5 YR RETURNS

F TEST

LEVEL OF SIGNIFICANCE	0.05000
P VLAUE	0.00001

REJECT THE NULL HYPOTHESIS

SEPARATE T TEST

LEVEL OF SIGNIFICANCE	0.05000
P VALUE	0.35635

CANNOT REJECT THE NULL HYPOTHESIS

RESULT- THERE ISN'T SIGNIFICANT DIFFERENCE IN HIGH RISK & AVERAGE RISK 5YR RETURNS

CONCLUSION- HIGH RISK AND AVERAGE RISK FUNDS GIVE SIMILAR RETURNS IN 5YR

CONCLUSION- There isn't significant difference in return of the three risk slots.

10 Year Returns to Investment

COMPARING HIGH RISK AND LOW RISK FUNDS FOR 10 YR RETURNS

F TEST

LEVEL OF SIGNIFICANCE	0.05000
P VLAUE	0.00151

REJECT THE NULL HYPOTHESIS

SEPARATE T TEST

LEVEL OF SIGNIFICANCE	0.05000
P VALUE	0.08386

CANNOT REJECT THE NULL HYPOTHESIS

RESULT- THERE ISN'T MUCH DIFFERENCE IN HIGH RISK & LOW RISK 10YR RETURNS

CONCLUSION- HIGH RISK AND LOW RISK FUNDS GIVE SIMILAR RETURNS IN 10YR

COMPARING HIGH RISK AND AVERAGE RISK FUNDS FOR 10 YR RETURNS

F TEST

LEVEL OF SIGNIFICANCE	0.05000
P VLAUE	0.00130

REJECT THE NULL HYPOTHESIS

SEPARATE T TEST

LEVEL OF SIGNIFICANCE	0.05000
P VALUE	0.44035

CANNOT REJECT THE NULL HYPOTHESIS

RESULT- THERE ISN'T MUCH DIFFERENCE IN HIGH RISK & AVERAGE RISK RETURN IN 10YR

CONCLUSION- AVERAGE RISK AND HIGH RISK FUNDS GIVE SIMILAR RETURNS IN 10YR

CONCLUSION- There isn't significant difference in return of the three risk slots.

The tradeoff between low risk and high return doesn't stand in long term investments

The assumption that higher level of risk yield higher returns to investment has been rejected. This means, greater level of risk does not correspond to higher returns to investment.
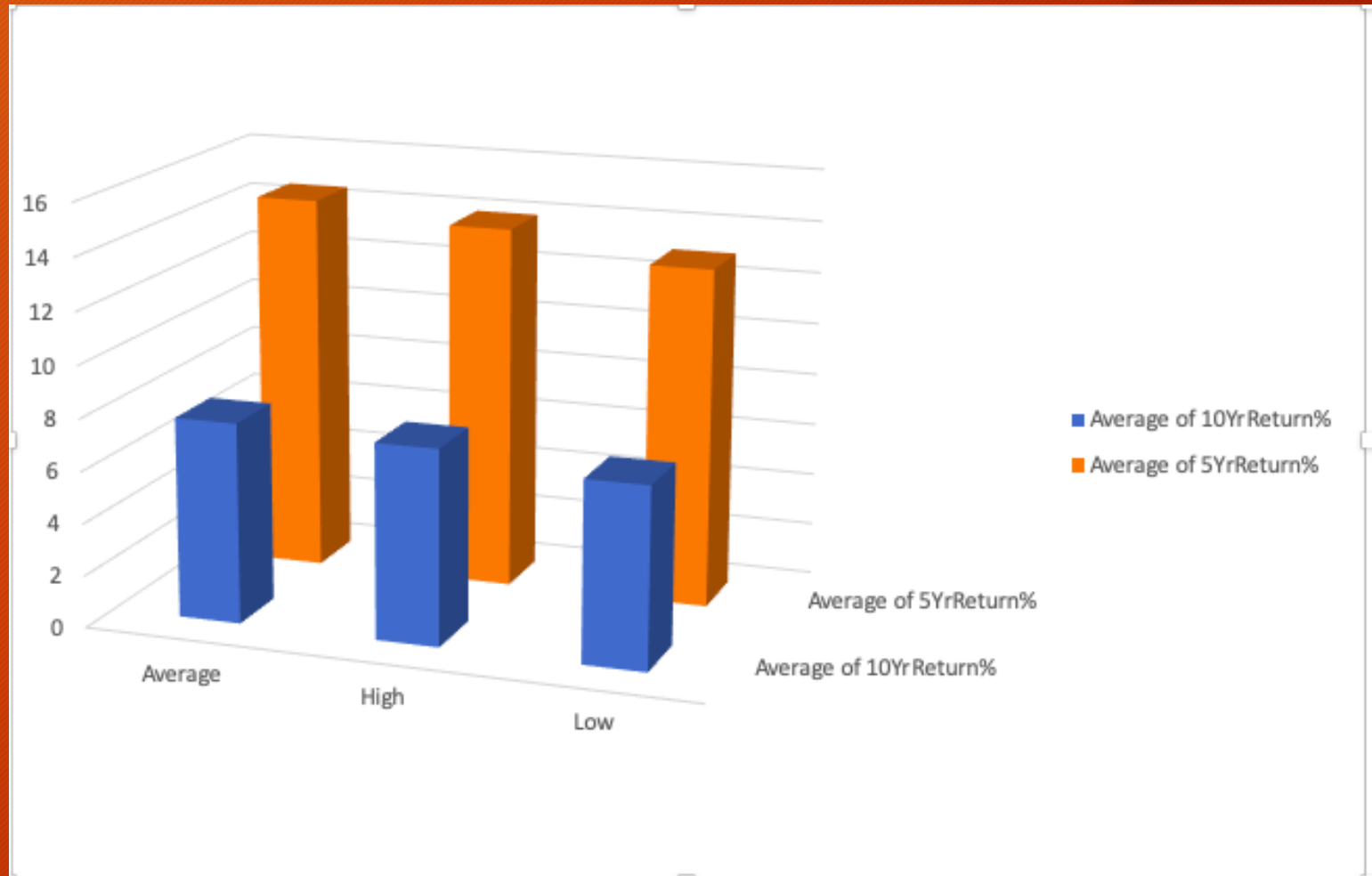
Do High Returns to Investment in short term guarantee high returns in Long Term for the same funds ?

TREND OF RETURNS ON INVESTMENT BASED ON PREVIOUS RETURNS OF SIMILAR FUNDS

- To analyse this, we will be using Coefficients of Correlation and Scatter Plots.
- In Excel, we use the given formula to find out the Coefficient of Correlation-

=CORREL(array1,array2)

- Here we find the coefficient of correlation for two different year returns at a time to see how strongly or weakly they are related to each other.
- The scatter plot's trendline reveals the same thing through its slope.

1-Year and 3-Year Returns

The coefficient of correlation for the two years is 0.596591.

<u>Finding</u>: There is strong positive relationship between the two numerical variables.

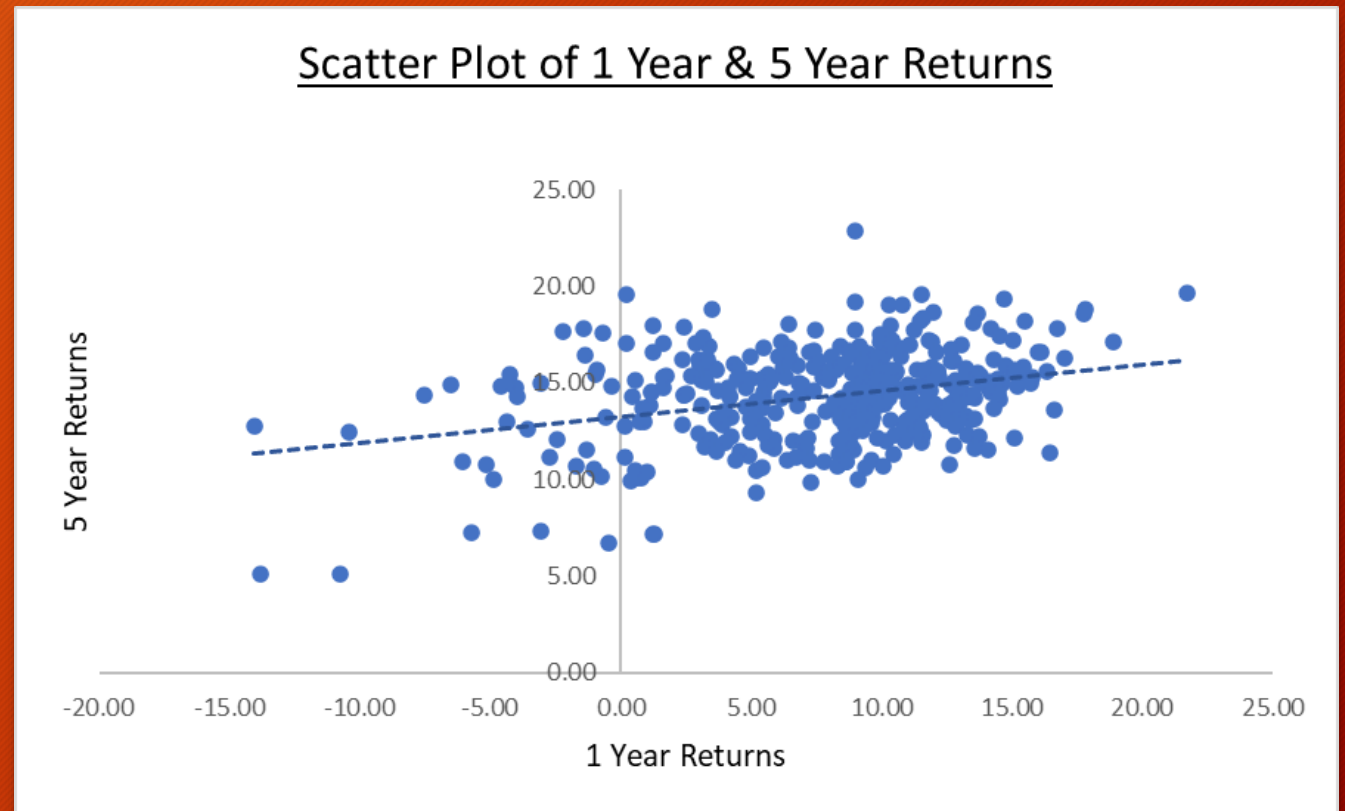<u>Interpretation</u>: Trend for Returns on Investments are similar for 1 Year and 3 Year.

Scatter Plot of 1 Year & 3 Year Returns
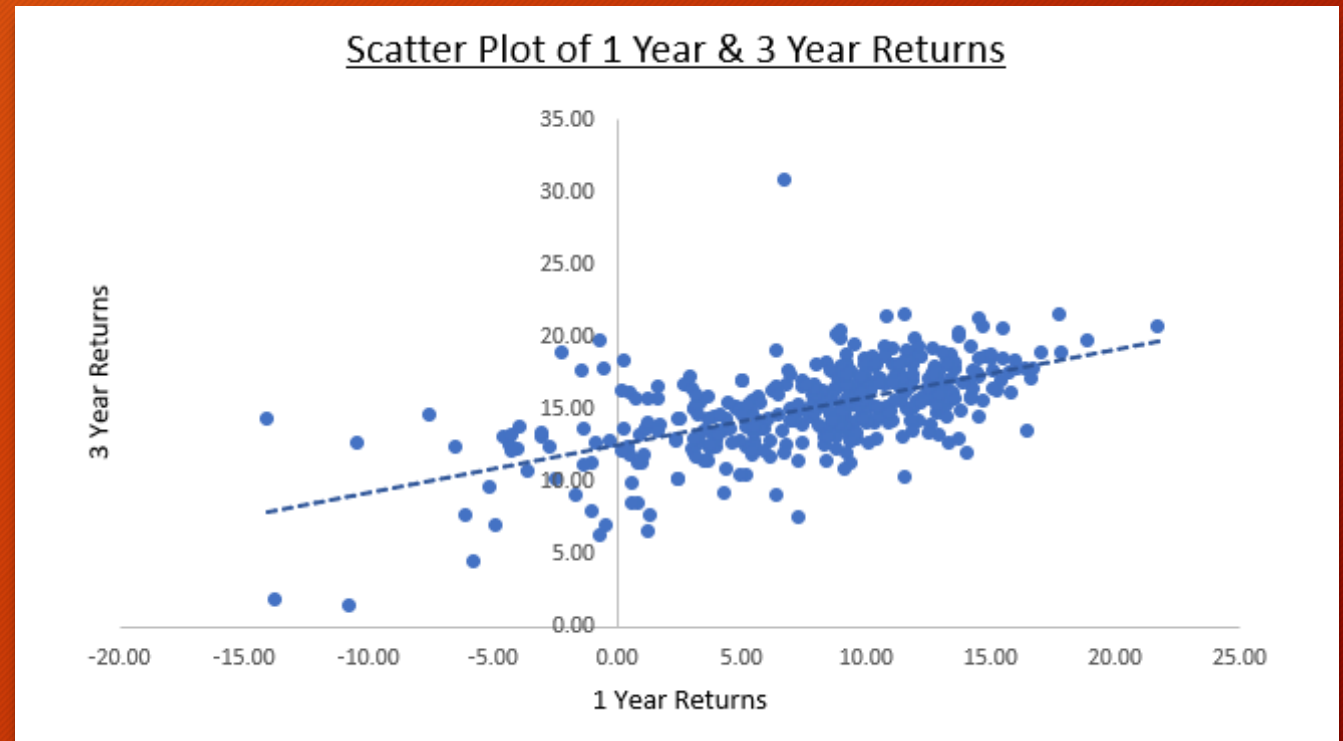
3-Year and 5-Year Returns

The coefficient of correlation for the two years is 0.680088.

Finding: There is strong positive relationship between the two numerical variables.

Interpretation: Trend for Returns on Investments are similar for 3 Year and 5 Year.

Scatter Plot of 3 Year & 5 Year Returns
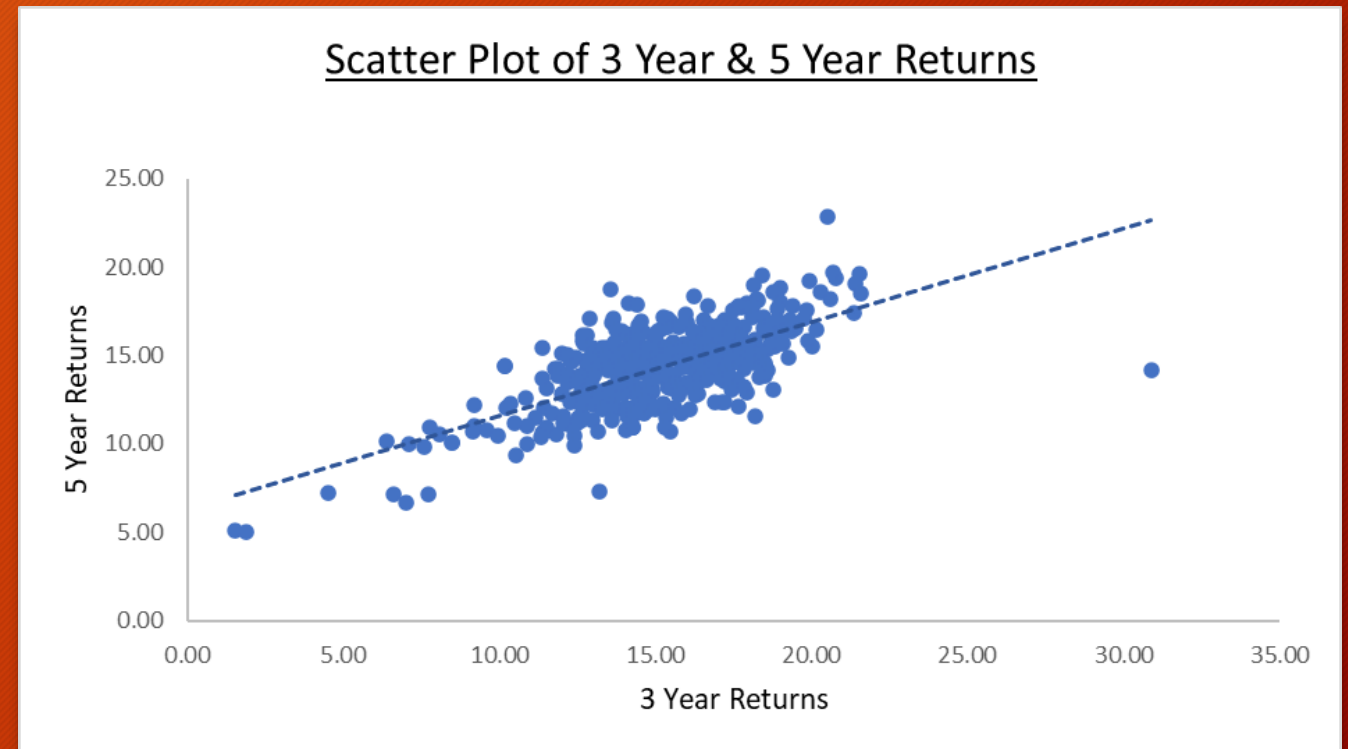
5-Year and 10-Year Returns

The coefficient of correlation for the two years is 0.538756.

Finding: There is strong positive relationship between the two numerical variables.

Interpretation: Trend for Returns on Investments are similar for 5 Year and 10 Year.

Scatter Plot of 5 Year & 10 Year Returns
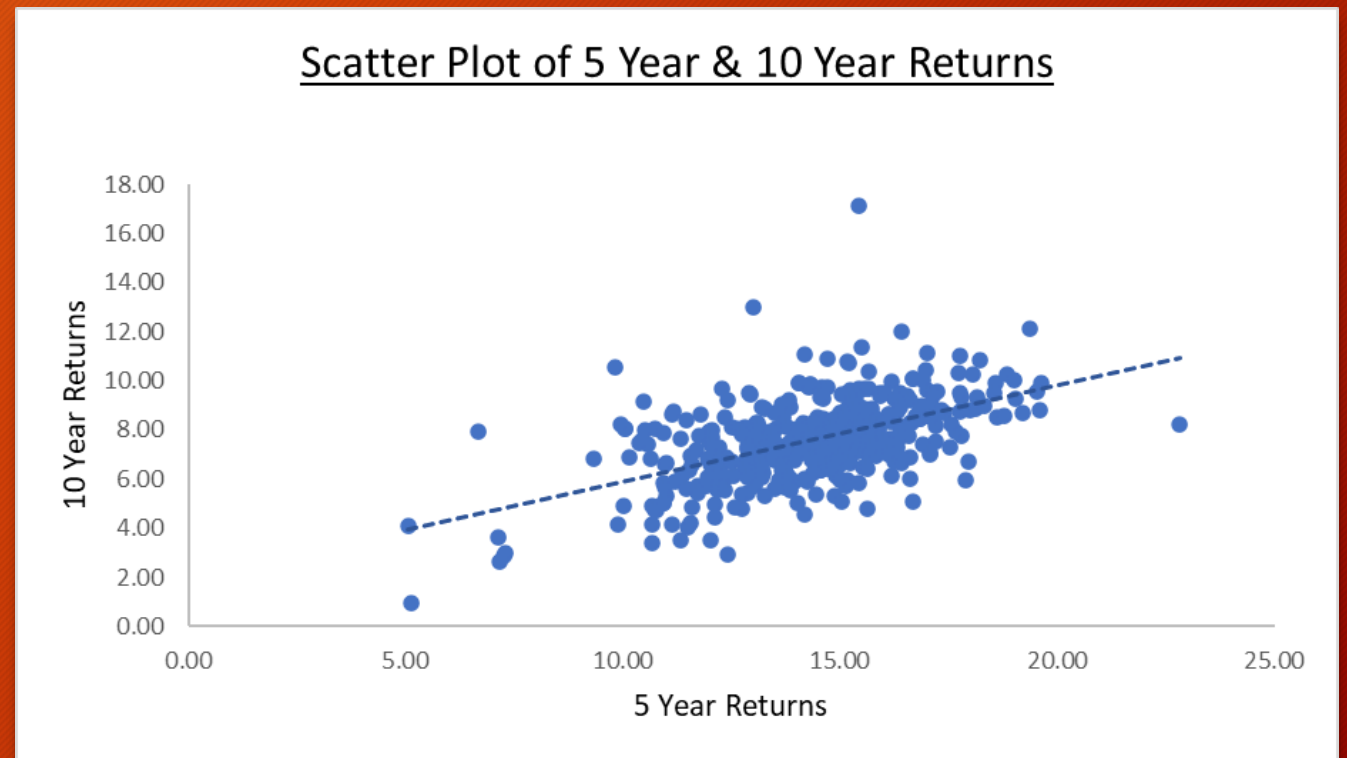
1-Year and 5-Year Returns

The coefficient of correlation for the two years is 0.31638.

<u>Finding</u>: There is weak positive relationship between the two numerical variables.

<u>Interpretation</u>: Trend for Returns on Investments are slightly similar for 1 Year and 5 Year.

Scatter Plot of 1 Year & 5 Year Returns

3-Year and 10-Year Returns

The coefficient of correlation for the two years is 0.277072.

Finding: There is weak positive relationship between the two numerical variables.

Interpretation: Trend for Returns on Investments are slightly similar for 3 Year and 10 Year.

Scatter Plot of 3 Year & 10 Year Returns
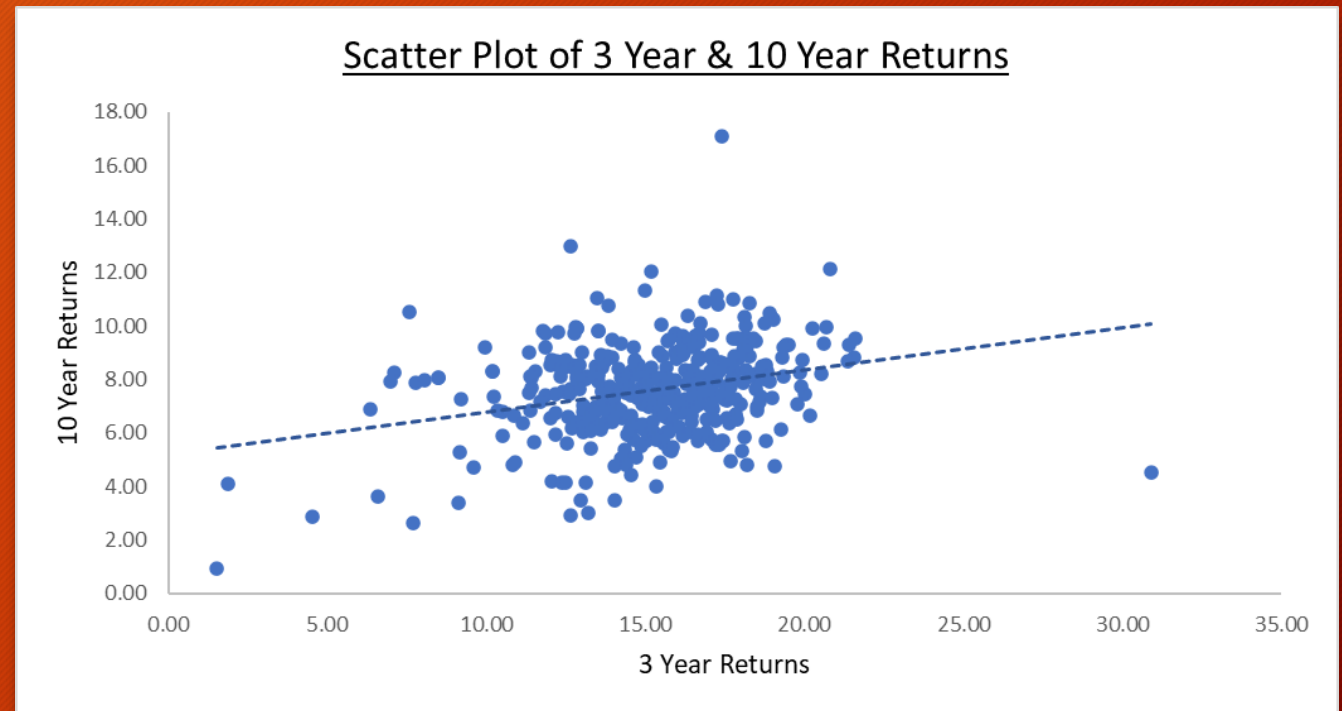
1-Year and 10-Year Returns

The coefficient of correlation for the two years is 0.131833.

Finding: There is very weak positive relationship between the two numerical variables.

Interpretation: The 1 year returns on funds don't show the same trend as 10 year returns on the same funds.

Scatter Plot of 1 Year & 10 Year Returns
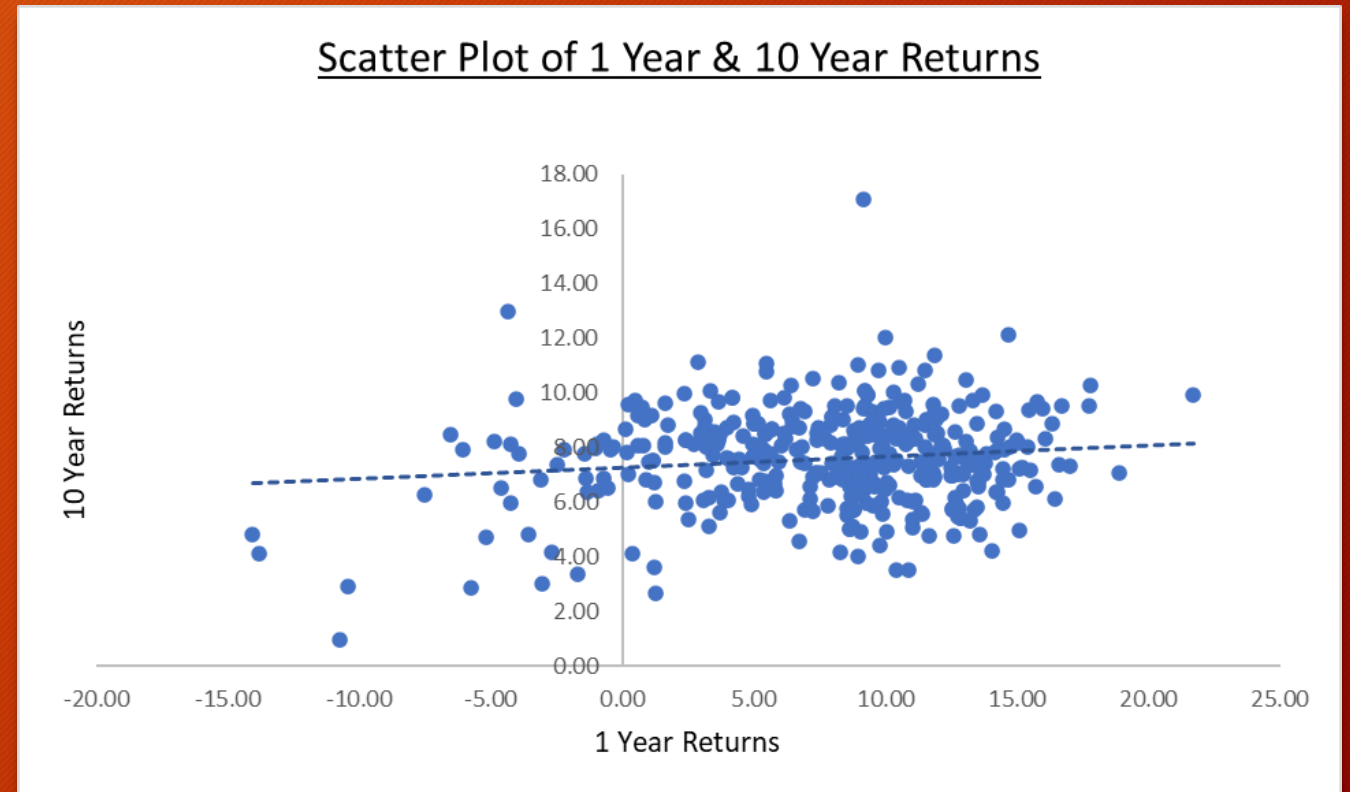
CONCLUSION

There is strong positive correlation between 1 & 3 Year Returns, 3 & 5 Year Returns, and 5 & 10 Year Returns. However, as we increase the time period, the relation becomes weaker as in the case of 1 & 5 Year Returns and 3 & 10 Year Returns. Finally, when we compare the correlation between 1 & 10 Year Returns, they are found to be very less related.

So, the strong positive correlation between the return percentages of closely gapped years does not guarantee an equally strong relation in the long term.

Checking Claims About Mean 1 YR Return To Investment

TWO TAILED T TEST

- Some websites claimed that the mean 1 year return % of all funds are usually 13%
- In order to check the validity of this particular claim, we ran a two tailed T test (since σ is unknown from given information)
- Null and Alternate Hypotheses:

$$H_{0:}\ \mu=13$$
$$H1:\ \mu\neq13$$

- Post the test, Null Hypothesis was rejected
- **Thus, enough evidence to reject the claim that the population mean 1 year return % is 13%**

TWO TAILED T TEST

Data	
Null Hypothesis μ =	13
Level of Significance	0.05
Sample Size	407
Sample Mean	7.81
Sample Standarad Deviation	5.439463649

Intermediate Calculations	
Standard Error of the Mean	0.269624203
Degrees Of Freedom	406
t Test Statistic	-19.23589151

Two-Tail Test	
lower Critical Value	-1.6486
Upper Critical Value	1.6486
p value	4.40262E-59
decision	REJECT THE NULL HYPOTHESIS

	Data
Null Hypothesis μ =	13
Level of Significance	0.05
Sample Size	407
Sample Mean	=B12
Sample Standarad Deviation	=B13

	Intermediate Calculations
Standard Error of the Mean	=H13/SQRT(H11)
Degrees Of Freedom	=H11-1
t Test Statistic	=(H12-H9)/H16

	Two-Tail Test
lower Critical Value	=-T.INV.2T(2*H10,H17)
Upper Critical Value	=T.INV.2T(2*H10,H17)
p value	=T.DIST.2T(ABS(H18),H17)
decision	=IF(H23<H10, "REJECT THE NULL HYPOTHESIS", "DON'T REJECT THE NULL HYPOTHE

FORMULAE

RESULTS

ONE TAILED T TEST

- Few negative values of 1 year return to investment in the data set could raise concerns about mean returns being negative or nil

- To prevent disincentivization, we carried out a one tail t test (since σ is unknown from given information and the rejection area is contained only in one of the tails(*upper tail in this case because we wished to reject 'null hypothesis' only when the sample mean was significantly greater than 0*) to check the validity of such a concern

- Null and Alternate Hypotheses:

$$H0: \mu \leq 0$$
$$H1: \mu > 0$$

- Post the test, Null Hypothesis was rejected

- Thus, enough evidence to conclude that the population mean 1 year return to investment will be positive

ONE TAILED T TEST

Data	
Null Hypothesis μ =	0
Level of Significance	0.05
Sample Size	407
Sample Mean	7.81
Sample Standarad Deviation	5.439463649

Intermediate Calculations	
Standard Error of the Mean	0.269624203
Degrees Of Freedom	406
t Test Statistic	28.97936461

Upper-Tail Test	
Upper critcical value	1.6486
p value	0.0000
	reject the null hypothesis

	Data
Null Hypothesis μ =	0
Level of Significance	0.05
Sample Size	=COUNT('full data'!M2:M408)
Sample Mean	=AVERAGE('full data'!I2:'full data'!I408)
Sample Standarad Deviation	=STDEV.S('full data'!I2:'full data'!I408)
	Intermediate Calculations
Standard Error of the Mean	=B13/SQRT(B11)
Degrees Of Freedom	=B11-1
t Test Statistic	=(B12-B9)/B16
	Upper-Tail Test
Upper critcical value	=T.INV.2T(2*B10,B17)
p value	=T.DIST.RT(B18,B17)
	=IF(B18>B21,"reject the null hypothesis", "don't reject")

FORMULAE

RESULTS

THANK YOU!