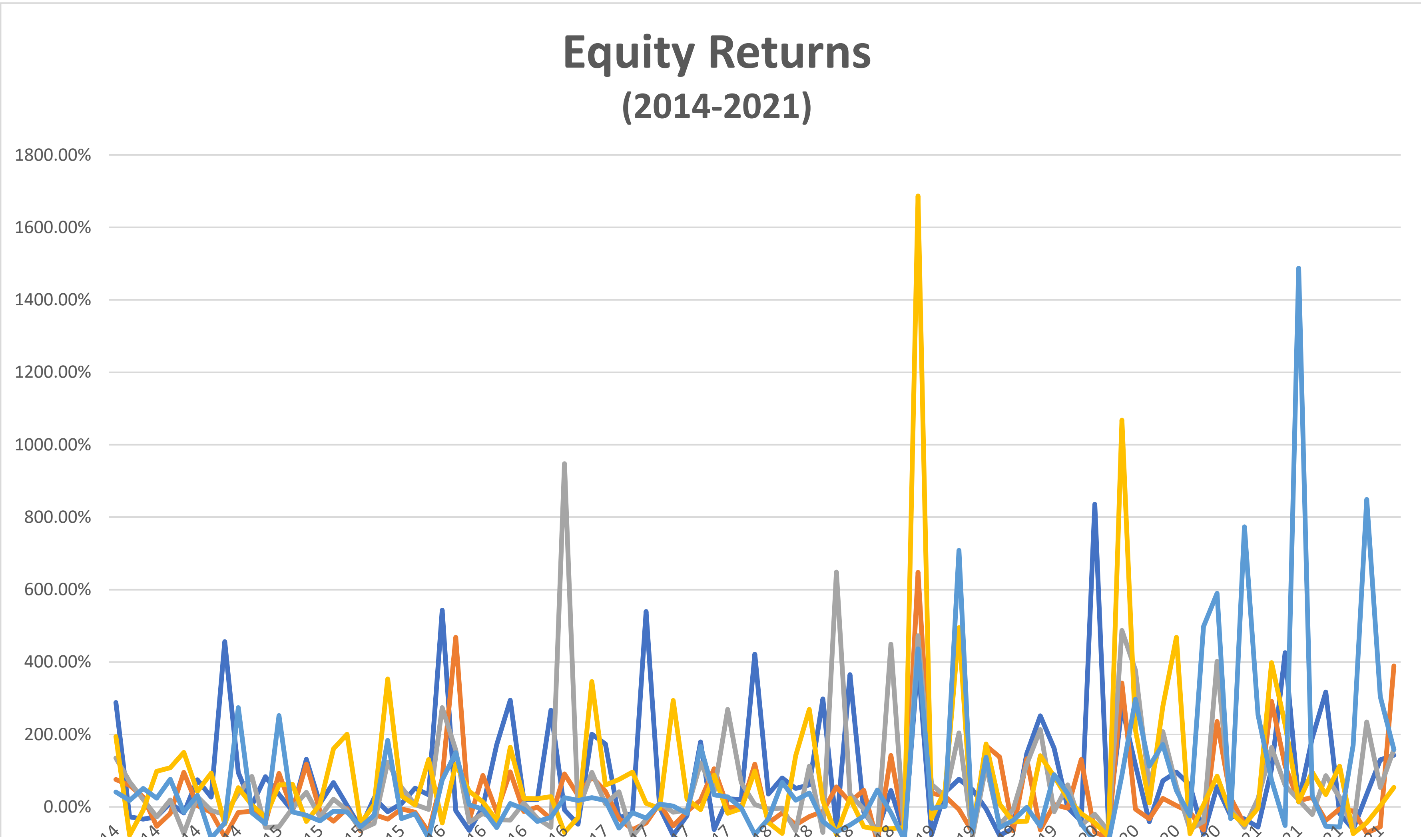
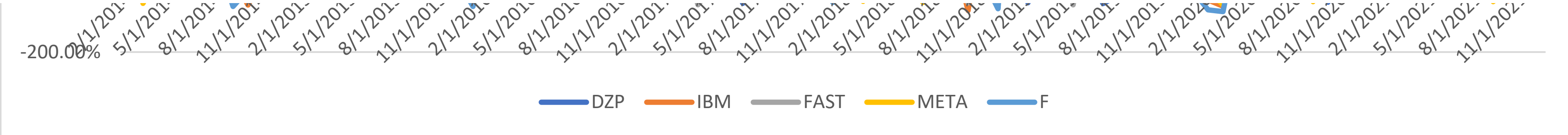
Portfolio Statistics and Diversification, Theory

Monthly 2014-2021

Date	DZP Price	IBM Price	FAST Price	META Price	F Price	S&P 500 Level	DZP EAR DZP
1/1/2014	70.61	176.68	21.79	62.57	14.79	1782.59	
2/1/2014	79.06	185.17	23.40	68.46	15.22	1859.45	288.23%
3/1/2014	76.97	192.49	24.45	60.24	15.43	1872.34	-27.49%
4/1/2014	74.38	196.47	24.84	59.78	15.97	1883.95	-33.68%
5/1/2014	72.45	184.36	24.18	63.30	16.26	1923.57	-27.06%
6/1/2014	73.09	181.27	24.54	67.29	17.05	1960.23	11.13%
7/1/2014	72.00	191.67	22.00	72.65	16.83	1930.67	-16.50%
8/1/2014	75.45	192.30	22.46	74.82	17.22	2003.37	75.36%
9/1/2014	76.96	189.83	22.27	79.04	14.62	1972.29	26.84%
10/1/2014	88.79	164.40	21.84	74.99	13.93	2018.05	456.14%
11/1/2014	93.85	162.17	22.42	77.70	15.55	2067.56	94.47%
12/1/2014	94.17	160.44	23.59	78.02	15.33	2058.90	4.17%
1/1/2015	99.05	153.31	22.02	75.91	14.55	1994.99	83.36%
2/1/2015	101.53	161.94	20.61	78.97	16.16	2104.50	34.55%
3/1/2015	100.55	160.50	20.55	82.22	15.96	2067.89	-10.99%
4/1/2015	107.85	171.29	21.14	78.77	15.62	2085.51	131.88%
5/1/2015	108.66	169.65	20.59	79.19	15.00	2107.39	9.39%
6/1/2015	113.40	162.66	20.92	85.77	14.84	2063.11	66.92%
7/1/2015	113.84	161.99	20.76	94.01	14.66	2103.84	4.76%
8/1/2015	105.94	147.89	19.11	89.43	13.72	1972.18	-57.81%
9/1/2015	107.91	144.97	18.16	89.90	13.42	1920.03	24.74%



Equity Returns
(2014-2021)
1800.00%
1600.00%
1400.00%
1200.00%
1000.00%
800.00%
600.00%
400.00%
200.00%
0.00%


-200.00%
DZP
IBM
FAST
META
F

Probility Measures

	DZP	IBM	FAST
Average	82.72%	30.32%	63.44%
Variance	2.68	1.38	2.72
StDev	163.71%	117.36%	165.01%
CV	1.98	3.87	2.60
Skewness	1.97	2.77	2.77
Kurtosis	4.73	9.93	9.86

META	F	S&P 500	US 1 Year
83.99%	75.15%	25.81%	2.99%
5.30	5.35	0.36	0.00
230.20%	231.30%	60.08%	0.31%
2.74	3.08	2.33	0.11
4.65	3.60	1.86	-0.90
27.69	16.22	6.54	0.75

Variance/Covariance Matrix: Simple Example

	A	B	C
W	20%	50%	30%
	A	**B**	**C**
1	12%	23%	10%
2	10%	5%	11%
3	8%	10%	6%
4	-2%	5%	3%
AVG	7.00%	10.75%	7.50%

Create Var/Cov Matrix

=MMULT(array1, array2)

=TRANSPOSE(array)

Variance-Covariance Matrix

		Stocks		
		A	**B**	**C**
Stocks	**A**	var_{A}	$cov_{A,B}$	$cov_{A,C}$
	B	$cov_{B,A}$	var_{B}	$cov_{A,B}$
	C	$cov_{C,A}$	$cov_{C,B}$	var_{C}

		Stocks		
		A	**B**	**C**
Stocks	**A**	0.0039	0.0032	0.0021
	B	0.0032	0.0072	0.0013
	C	0.0021	0.0013	0.0014

=MMULT(TRANSPOSE(Returns - Averages), (Returns - Averages

=MMULT(TRANSPOSE(B7:D10 - B11:D11), (B7:D10 - B11:D11))/

;))/(n-1)

Portfolio Calculations: Simple Example

		Weights	Variance-Covariance Matrix		
			A	B	C
A		20.00%	0.0039	0.0032	0.0021
B	W	50.00%	0.0032	0.0072	0.0013
C		30.00%	0.0021	0.0013	0.0014

V

Average	7.00%	10.75%	7.50%
Weights	20.00%	50.00%	30.00%

<u>Expected Return (Weighted Average)</u>

=SUMPRODUCT(array_x,array_y)

=SUMPRODUCT(TRANSPOSE(C6:C8), D10:F10)

9.03%

<u>Standard Deviation</u> $\sigma_P =$

=SQRT(MMULT(MMULT (TRANSPOSE(W), V), W))

=SQRT(MMULT(MMULT(TRANSPOSE(C6:C8),D6:F8),C6:C8))

5.78%

$$= \sqrt{W'VW}$$

Variance/Covariance Matrix: Complete Example

	DZP	IBM	FAST	META	F
Weights	20.00%	20.00%	20.00%	20.00%	20.00%
Averages	82.72%	30.32%	63.44%	83.99%	75.15%
N	95				

Monthly EAR's 2014-2021

Date	DZP	IBM	FAST	META	F
2/1/2014	288.23%	75.63%	135.24%	194.34%	41.05%
3/1/2014	-27.49%	59.24%	69.34%	-78.45%	17.87%
4/1/2014	-33.68%	27.84%	20.91%	-8.79%	51.10%
5/1/2014	-27.06%	-53.39%	-27.61%	98.69%	24.10%
6/1/2014	11.13%	-18.36%	19.40%	108.24%	76.70%
7/1/2014	-16.50%	95.32%	-73.05%	150.85%	-14.43%
8/1/2014	75.36%	4.02%	28.19%	42.36%	31.64%
9/1/2014	26.84%	-14.37%	-9.69%	93.17%	-85.97%
10/1/2014	456.14%	-82.20%	-20.86%	-46.80%	-44.02%
11/1/2014	94.47%	-15.12%	36.96%	53.11%	274.41%
12/1/2014	4.17%	-12.08%	84.12%	5.06%	-15.72%
1/1/2015	83.36%	-42.04%	-56.24%	-28.04%	-46.56%
2/1/2015	34.55%	92.93%	-54.80%	60.68%	252.32%
3/1/2015	-10.99%	-10.16%	-3.44%	62.25%	-13.88%
4/1/2015	131.88%	118.32%	40.45%	-40.21%	-22.77%
5/1/2015	9.39%	-10.90%	-27.12%	6.59%	-38.49%
6/1/2015	66.92%	-39.64%	21.02%	160.60%	-12.08%
7/1/2015	4.76%	-4.83%	-8.80%	200.65%	-13.62%
8/1/2015	-57.81%	-66.47%	-62.98%	-45.08%	-54.85%
9/1/2015	24.74%	-21.28%	-45.77%	6.49%	-23.30%
10/1/2015	-12.95%	-33.75%	123.67%	353.47%	184.09%
11/1/2015	9.38%	-5.51%	53.86%	30.24%	-32.40%
12/1/2015	51.41%	-14.44%	6.76%	4.94%	-18.53%

1/1/2016	33.06%	-69.10%	-6.89%	130.68%	-86.21%
2/1/2016	542.88%	79.59%	274.44%	-43.98%	74.36%
3/1/2016	-10.14%	468.57%	157.25%	118.13%	149.65%
4/1/2016	-64.77%	-35.90%	-42.35%	43.41%	5.53%
5/1/2016	0.00%	86.79%	-17.97%	13.30%	-6.09%
6/1/2016	171.71%	-14.27%	-35.18%	-37.28%	-57.17%
7/1/2016	294.53%	97.25%	-36.58%	164.79%	9.04%
8/1/2016	20.14%	-12.25%	10.68%	23.27%	-5.60%
9/1/2016	19.91%	-0.23%	-31.36%	22.49%	-40.04%
10/1/2016	267.33%	-32.72%	-56.54%	28.63%	-28.56%
11/1/2016	-8.18%	91.21%	947.73%	-70.20%	25.27%
12/1/2016	-47.56%	31.74%	-10.21%	-29.28%	17.49%
1/1/2017	200.69%	82.46%	95.62%	346.16%	25.61%
2/1/2017	173.58%	43.19%	8.60%	60.21%	18.03%
3/1/2017	-29.78%	-31.97%	41.62%	75.58%	-58.69%
4/1/2017	-17.39%	-63.01%	-81.80%	96.10%	-16.35%
5/1/2017	539.41%	-44.43%	-33.84%	10.10%	-30.60%
6/1/2017	-1.07%	9.85%	10.57%	-3.74%	7.91%
7/1/2017	-77.94%	-52.13%	-14.50%	293.83%	2.19%
8/1/2017	-24.12%	-12.79%	-8.13%	21.08%	-17.83%
9/1/2017	179.35%	18.62%	121.52%	-7.41%	166.88%
10/1/2017	-62.42%	105.58%	43.44%	87.51%	33.69%
11/1/2017	22.81%	-0.70%	269.32%	-17.59%	27.74%
12/1/2017	19.62%	-4.20%	67.42%	-4.77%	-2.87%
1/1/2018	421.76%	117.77%	6.37%	99.19%	-75.87%
2/1/2018	35.50%	-44.64%	-5.16%	-43.07%	-33.00%
3/1/2018	79.86%	-16.99%	-3.05%	-73.20%	68.23%
4/1/2018	51.07%	-49.41%	-65.21%	141.96%	18.77%
5/1/2018	60.72%	-26.36%	112.78%	269.23%	38.61%
6/1/2018	298.19%	-12.85%	-70.15%	17.10%	-39.91%
7/1/2018	-57.67%	55.43%	648.69%	-75.92%	-69.02%
8/1/2018	365.21%	13.62%	34.73%	24.24%	-49.78%
9/1/2018	-14.11%	46.43%	-6.44%	-54.86%	-25.53%
10/1/2018	-66.99%	-96.08%	-76.59%	-61.79%	46.67%

11/1/2018	45.48%	142.42%	449.43%	-60.07%	-16.24%
12/1/2018	-73.85%	-65.70%	-77.75%	-56.88%	-91.67%
1/1/2019	403.10%	647.85%	472.91%	1686.82%	436.85%
2/1/2019	-77.09%	38.64%	61.99%	-31.84%	-4.02%
3/1/2019	40.16%	29.08%	29.02%	46.71%	1.38%
4/1/2019	76.24%	-6.83%	204.42%	495.06%	708.09%
5/1/2019	47.58%	-69.69%	-81.93%	-64.35%	-67.32%
6/1/2019	-5.11%	168.87%	114.33%	173.65%	137.06%
7/1/2019	-78.81%	138.13%	-49.32%	7.92%	-57.28%
8/1/2019	-59.39%	-65.89%	-6.85%	-41.78%	-37.00%
9/1/2019	146.96%	132.84%	118.18%	-39.40%	-1.30%
10/1/2019	251.78%	-63.42%	213.74%	141.39%	-53.74%
11/1/2019	161.78%	6.66%	-13.26%	84.00%	89.50%
12/1/2019	-2.10%	-3.60%	60.67%	23.73%	36.85%
1/1/2020	-39.45%	131.08%	-49.88%	-17.87%	-47.05%
2/1/2020	835.61%	-69.61%	-20.64%	-43.71%	-94.17%
3/1/2020	-42.69%	-85.30%	-66.29%	-82.05%	-98.75%
4/1/2020	276.56%	342.21%	487.69%	1067.66%	87.61%
5/1/2020	115.47%	-6.13%	377.55%	212.32%	297.21%
6/1/2020	-40.62%	-33.20%	56.65%	11.08%	112.43%
7/1/2020	72.48%	23.83%	207.54%	277.84%	172.63%
8/1/2020	96.29%	3.67%	57.49%	468.51%	45.54%
9/1/2020	59.93%	-14.84%	-61.75%	-74.20%	-24.79%
10/1/2020	-75.44%	-64.31%	-39.76%	5.69%	497.67%
11/1/2020	55.85%	235.80%	401.89%	85.16%	590.04%
12/1/2020	-24.55%	25.50%	-5.25%	-15.31%	-32.26%
1/1/2021	-33.25%	-48.49%	-56.13%	-48.82%	773.52%
2/1/2021	-55.59%	-1.80%	22.58%	-3.25%	254.07%
3/1/2021	104.46%	291.65%	164.18%	398.65%	73.54%
4/1/2021	425.71%	112.16%	59.69%	226.84%	-51.15%
5/1/2021	13.66%	16.92%	18.91%	14.34%	1487.51%
6/1/2021	190.11%	26.57%	-21.15%	96.13%	30.93%
7/1/2021	317.51%	-37.50%	86.41%	34.02%	-53.15%
8/1/2021	-17.96%	-5.15%	26.41%	112.37%	-55.90%

9/1/2021	-61.89%	-11.41%	-61.23%	-73.73%	171.29%
10/1/2021	34.77%	-71.59%	234.97%	-43.61%	848.63%
11/1/2021	130.13%	-54.75%	53.96%	3.35%	304.62%
12/1/2021	142.68%	389.03%	159.31%	54.02%	158.43%

Variance-Covariance Matrix

		Stocks			
		DZP	**IBM**	**FAST**	**META**
Stocks	**DZP**	2.6800	0.3169	0.2721	0.8990
	IBM	0.3169	1.3773	0.8906	1.6025
	FAST	0.2721	0.8906	2.7228	1.3083
	META	0.8990	1.6025	1.3083	5.2991
	F	-0.3365	0.3502	0.7022	0.9464

=MMULT(TRANSPOSE(Returns - Averages), (Returns - Average:

=MMULT(TRANSPOSE(B11:F105 - B6:F6), (B11:F105 - B6:F6))/(

F
-0.3365
0.3502
0.7022
0.9464
5.3498

s))/(n-1)
(B7-1)

Portfolio Calculations: Complete Example

	Weights	Variance-Covarianc		
		DZP	**IBM**	**FAST**
DZP	20.00%	2.6800	0.3169	0.2721
IBM	20.00%	0.3169	1.3773	0.8906
FAST	20.00%	0.2721	0.8906	2.7228
META	20.00%	0.8990	1.6025	1.3083
F	20.00%	-0.3365	0.3502	0.7022

Average	82.72%	30.32%	63.44%
Weights	20.00%	20.00%	20.00%

Solver
1) MVP
2) Minimize

ce Matrix	
META	F
0.8990	-0.3365
1.6025	0.3502
1.3083	0.7022
5.2991	0.9464
0.9464	5.3498

83.99%	75.15%
20.00%	20.00%

Expected Return (Weighted Average)

=SUMPRODUCT(array_x,array_y)

=SUMPRODUCT(TRANSPOSE(C6:C8),

67.12%

Standard Deviation

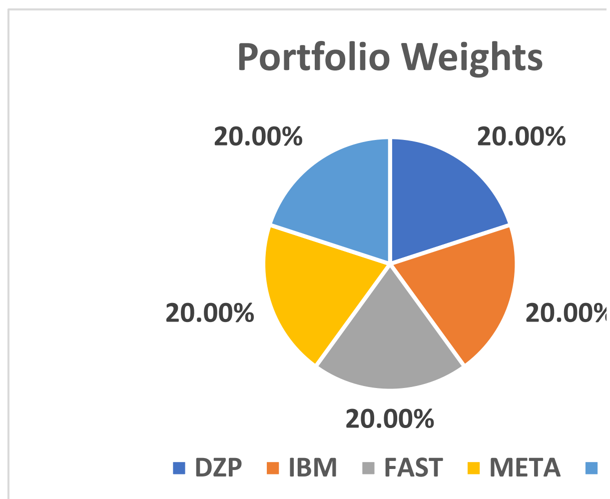
=SQRT(MMULT(MMULT (TRANSPOSE(

=SQRT(MMULT(MMULT(TRANSPOSE((

111.95%

e Coffficient of Variation (CV)

CV	=Stdev/Return
	=J12/J7
	166.79%



:6:C8),D6:F8),C6:C8))

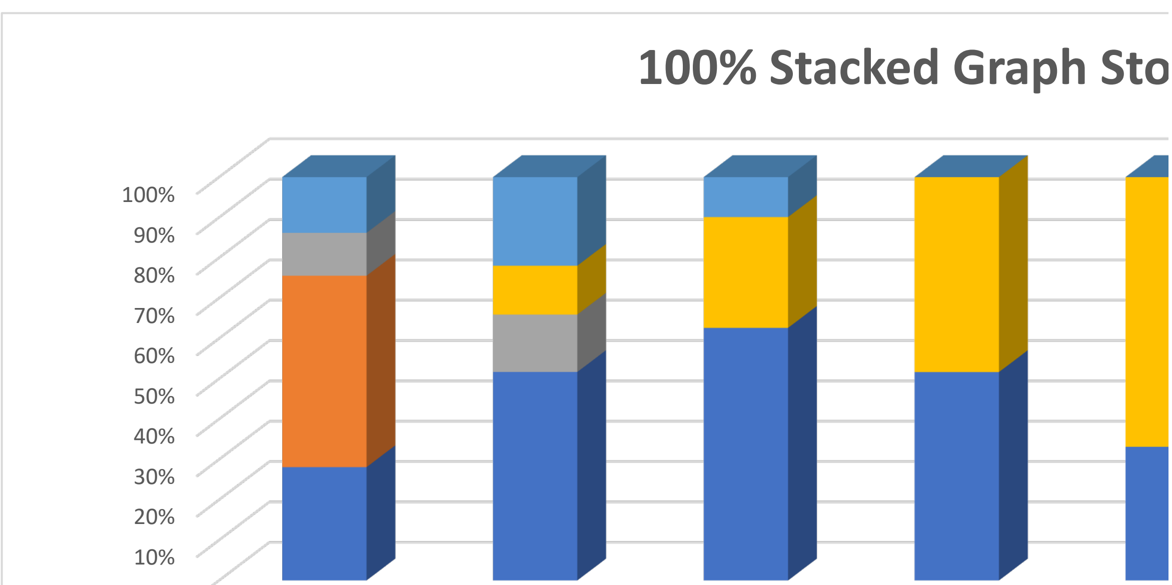
%
F

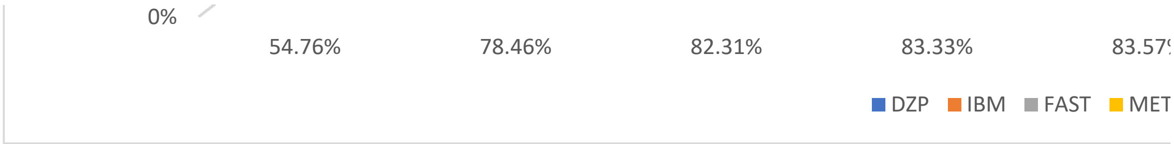
Efficient Frontier

NOTE: Short Sales Constraint

	Weights	Variance-Covariance		
		DZP	**IBM**	**FAST**
DZP	20.00%	2.6800	0.3169	0.2721
IBM	20.00%	0.3169	1.3773	0.8906
FAST	20.00%	0.2721	0.8906	2.7228
META	20.00%	0.8990	1.6025	1.3083
F	20.00%	-0.3365	0.3502	0.7022
	Average	82.72%	30.32%	63.44%
	100.00%			

STDev	94.11%	115.00%	135.00%	155.00%
Max E(r)	54.76%	78.46%	82.31%	83.33%
DZP	28.09%	51.68%	62.63%	51.66%
IBM	47.45%	0.00%	0.00%	0.00%
FAST	10.64%	14.24%	0.00%	0.00%
META	0.00%	12.11%	27.47%	48.34%
F	13.82%	21.97%	9.91%	0.00%




0%
54.76%
78.46%
82.31%
83.33%
83.57
DZP
IBM
FAST
MET

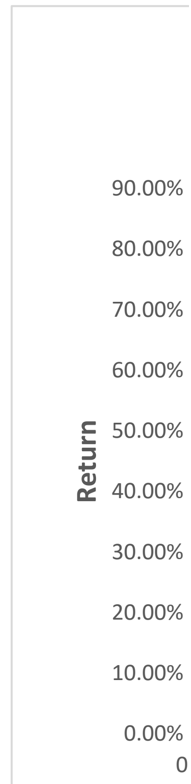
e Matrix	
META	F
0.8990	-0.3365
1.6025	0.3502
1.3083	0.7022
5.2991	0.9464
0.9464	5.3498
83.99%	75.15%

Expected Return (Weighted Ave

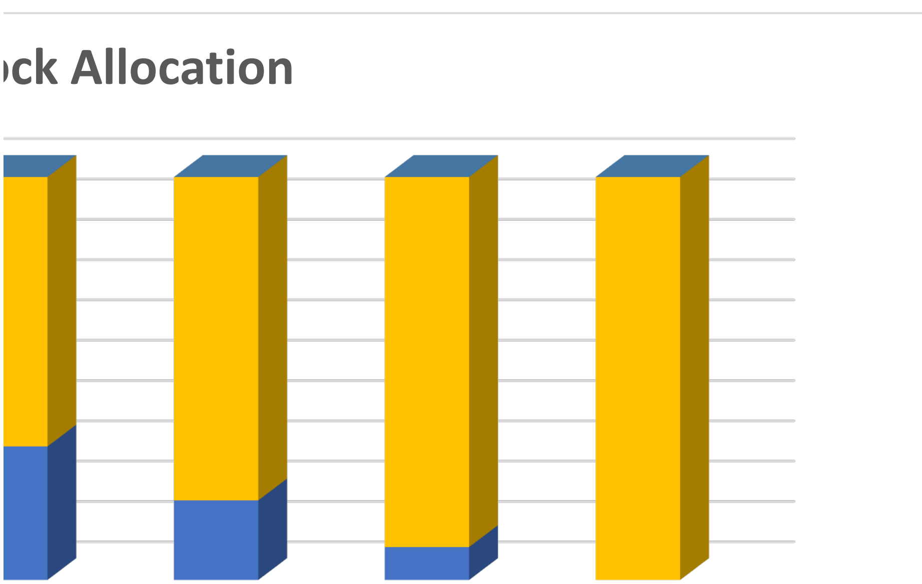
67.12%

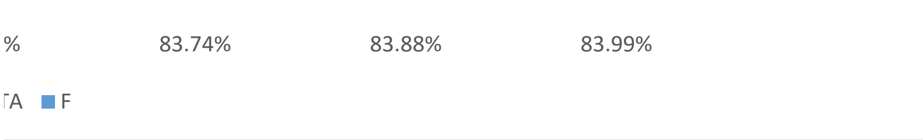
Standard Deviation

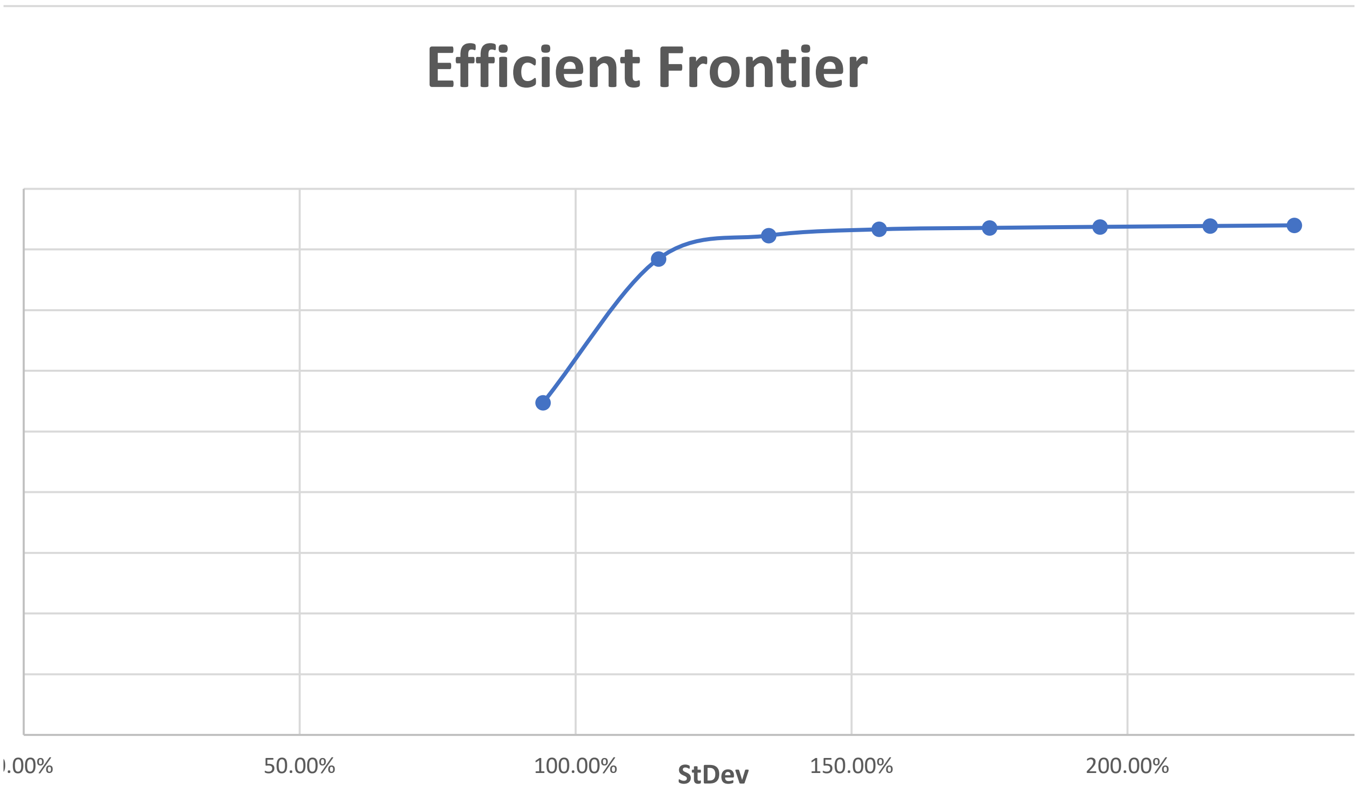
111.95%

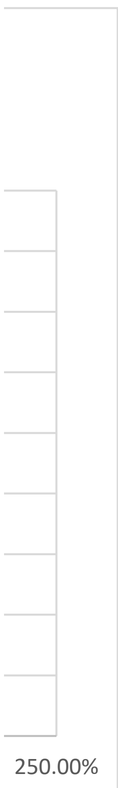


175.00%	195.00%	215.00%	230.20%
83.57%	83.74%	83.88%	83.99%
33.12%	19.75%	8.16%	0.00%
0.00%	0.00%	0.00%	0.00%
0.00%	0.00%	0.00%	0.00%
66.88%	80.25%	91.84%	100.00%
0.00%	0.00%	0.00%	0.00%




%
83.74%
83.88%
83.99%
TA
F


Efficient Frontier
.00%
50.00%
100.00%
150.00%
200.00%
StDev


250.00%

Regression

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.160925293
R Square	**0.02589695**
Adjusted R Square	0.015422724
Standard Error	1.62440245
Observations	95

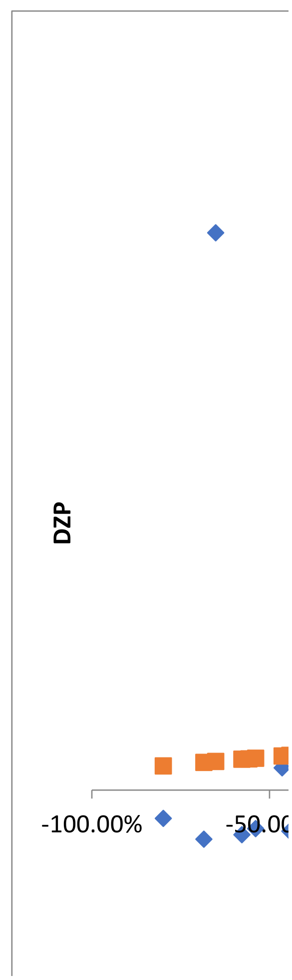
ANOVA

	df	*SS*	*MS*	*F*
Regression	1	6.523999727	6.523999727	2.472445131
Residual	93	245.3975488	2.63868332	
Total	94	251.9215485		

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.713987154	0.18153593	3.93303494	0.00016147
S&P 500	**0.438526284**	0.278889586	1.572401072	0.119253654

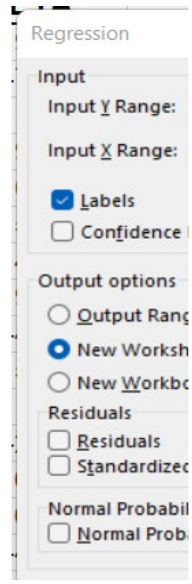
RESIDUAL OUTPUT

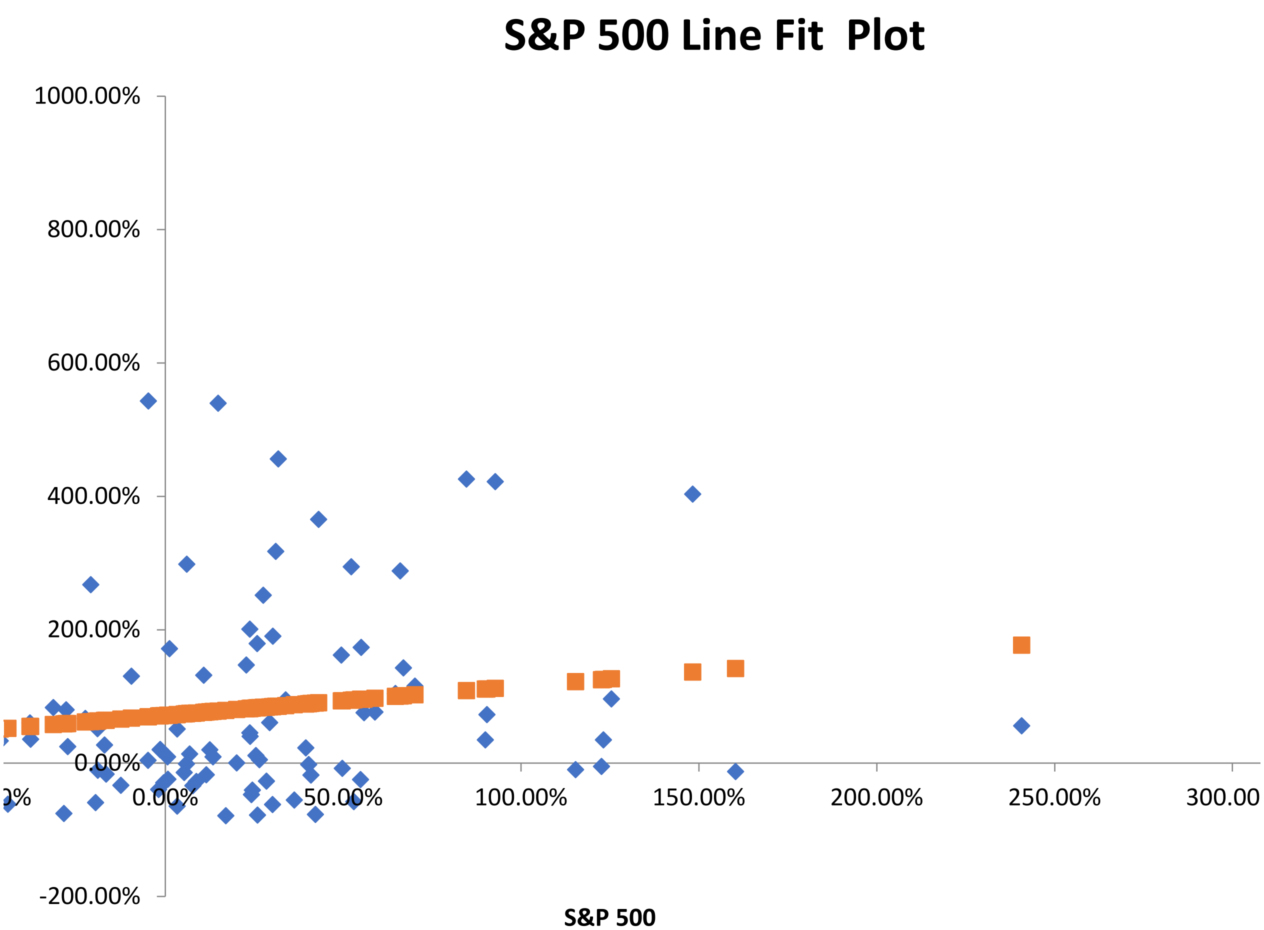
Observation	*Predicted DZP*	*Residuals*
1	1.003227429	1.879055499
2	0.751889835	-1.026826209
3	0.747753873	-1.084597039
4	0.838396972	-1.108961987
5	0.82548794	-0.714178855
6	0.640893926	-0.805878662
7	0.958794888	-0.205233508
8	0.638966306	-0.370526744
9	0.852930865	3.708518193
10	0.862017596	0.082637793
11	0.69244662	-0.650754158
12	0.575834126	0.257758752
13	1.108171507	-0.76268646
14	0.630713797	-0.740586201
15	0.760988279	0.557777563
16	0.772496232	-0.67855343
17	0.615340596	0.053905028
18	0.829932737	-0.7823653
19	0.477391284	-1.055519016
20	0.593392107	-0.345949173
21	1.416907679	-1.546410776
22	0.716651821	-0.622847977
23	0.630132256	-0.116036823
24	0.510231281	-0.179602439

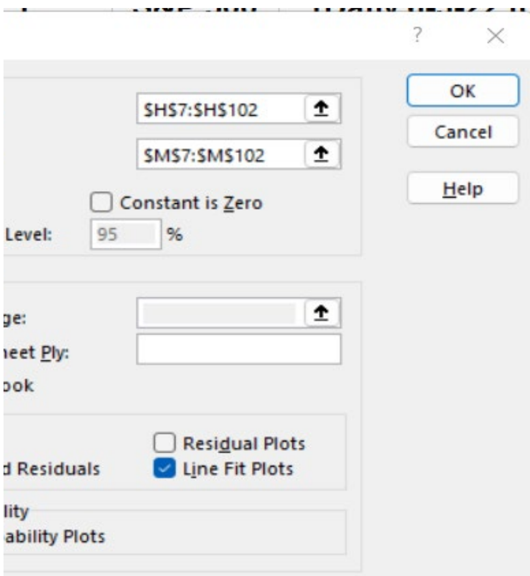


Significance F
0.119253654

Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
0.353492776	1.074481532	0.353492776	1.074481532
-0.115293162	0.992345729	-0.115293162	0.992345729







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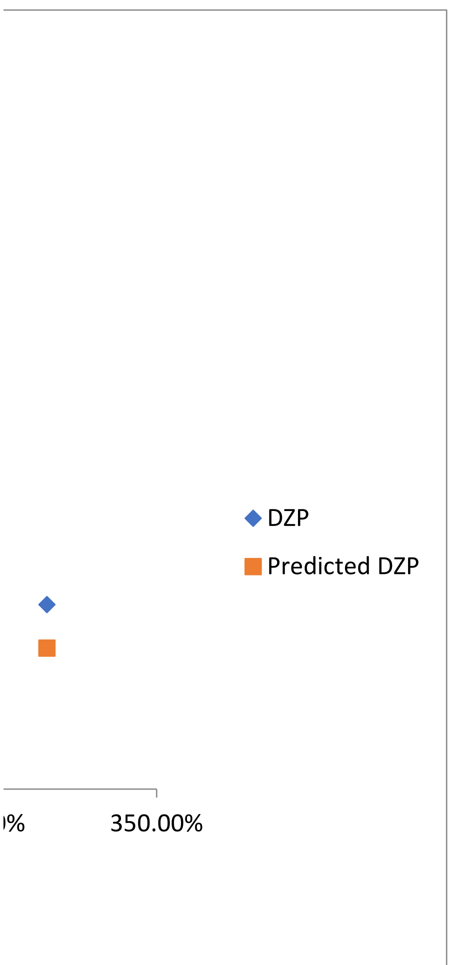

DZP
Predicted DZP
0%
350.00%

CAPM

$$CAPM = r_f + \beta_i[E(r_M) - r_f]$$

r_f	2.99%
β	0.439
r_M	25.81%

CAPM = E6 + E7 * (E8 - E6)
CAPM = 13.00%