import import from pa import %matple In [347 [tickers In [348 # Import	ort data
Out[348 Attributes Symbols Date 2017-11 05 2017-11 1 2017-11 1 2017-11 1 2017-11 1 2017-11	Adj Close Close Open Vert- SNX- VRA- ALGO- USD
2019-07 02 2019-07 03 2019-07 04 2019-07 04	Adj Close Cl
In [350 # Clos. df = df df.head Out[350 Symb 2019-07- 2019-07- 2019-07- 2019-07-	hols VET-USD NX-USD VRA-USD ALGO-USD ADA-USD LINK-USD MANA-USD CHZ-USD Cate 7-01 0.008065 0.278686 0.000662 1.347235 0.083822 3.591973 0.048321 0.017028 7-02 0.007611 0.294541 0.000684 1.136488 0.081077 3.645436 0.046326 0.016336 7-03 0.007738 0.365616 0.000676 1.115418 0.082998 3.533164 0.053414 0.012063 7-04 0.007321 0.334587 0.000655 1.009955 0.077774 3.484891 0.059570 0.013696 7-05 0.007483 0.329443 0.000728 1.126153 0.076532 3.622153 0.054378 0.016059
In [352 # Log cov_mate cov_	S VET SNX VRA ALGO ADA LINK MANA CHZ
Out[353 Symbols Symbols VET SNX VRA ALGO ADA LINK MANA	NET NOT NOT NOT NOT NOT NOT NOT NOT NOT NO
In [355 tickers Out[355 'VET', In [356 # Rando w = {'Vett', port_value port_	<pre>cov_matrix.mul(w, axis=0).mul(w, axis=1).sum().sum() for returns for individual companies for edf.resample('Y').last().pct_change().mean()</pre>
ALGO ADA LINK MANA CHZ dtype: : W = [0] port_er port_er port_er for the second of the	1.743331 1.322377 24.745528 1.224172 3.330496 1.804947 13.846148 4.606467 float64 cofolio returns 0.125,0.125,0.125,0.125,0.125,0.125,0.125] or = (w*ind_er).sum() or it = df.pct_change().apply(lambda x: np.log([*x]).std().apply(lambda x: x*np.sqrt(365))
ADA LINK MANA CHZ dtype: In [360 assets assets assets VET SNX	1.281621 1.454737 1.818142 1.300809 1.094745 1.226540 1.458208 1.554842 float64 S = pd.concat([ind_er, ann_sd], axis=1) # Creating a table for visualising returns and volatility of assets 3.columns = ['Returns', 'Volatility'] Returns Volatility 3.1743331 1.281621 4.1322877 1.454737
ALGO ADA LINK MANA CHZ In [361 p_ret = p_vol = p_weigh num_ass num_por	1.22474528 1.818142 1.224172 1.300809 1.3.330496 1.094745 1.804947 1.226540 1.3.846148 1.458208 2. 4.606467 1.554842 = [] # Define an empty array for portfolio returns = [] # Define an empty array for portfolio volatility that = [] # Define an empty array for asset weights seets = len(df.columns) ortfolios = 10000 ortfolio in range(num_portfolios): sights = np.random.random(num_assets)
p_v ref p_l var sd ann p_v In [363 data = for cou #pi dat In [364 portfor	<pre>sights = weights/np.sum(weights) weights.append weights, ind_er) # Returns are the product of individual expected returns of asset and its</pre>
Out[364 0 4.5099 1 6.375 2 6.522 3 4.8623 4 8.442 In [365 # Plot portfo	Uurns Volatility VET weight SNX weight VRA weight ALGO weight ADA weight LINK weight MANA weight CHZ weight 10905 1.073006 0.170320 0.170262 0.041348 0.164591 0.058387 0.183346 0.136616 0.075129 105731 1.087152 0.215965 0.164223 0.160914 0.037988 0.120629 0.139962 0.039038 0.121281 12671 1.115295 0.224036 0.080843 0.063788 0.103920 0.034744 0.034970 0.219950 0.237749 12346 1.068996 0.022620 0.039326 0.004254 0.201890 0.148084 0.281835 0.219213 0.082777 12471 1.093613 0.005868 0.103325 0.172082 0.166157 0.141301 0.054651 0.175537 0.181079 125 efficient frontier 126 click frontier 127 click plot scatter (x 'Volatility', y = Returns', marker o', s = 0, alpha = 1, grid = 100, figsize = (10, 11)) 127 click plot scatter (x 'Volatility', y = Returns')
10 Refurs 8	
# idxm. min_volumin_vo	5.579862 Lity 1.029582 Light 0.053241 Light 0.110525 Light 0.072691 Light 0.085511 Light 0.455343 Light 0.455343 Light 0.004702 Light 0.098296
Out[367	This collections. PathCollection at 0x7fsb40assudo
optimal optima	lity 1.223660 light 0.018179 light 0.021505 light 0.305332 light 0.021663 light 0.029651 light 0.035362 light 0.320405
plt.sca	acter min_vol_port[], min_vol_port[], color= r, marker= r, g==00) natter optimal risky port[], optimal risky port[], color= g, marker= r, g==00) *********************************
In [372 optima: In [384 optima: Out[384 VET weight NAMA weight NAMA weight Name: 5	ight 2.15 ight 30.53 eight 2.17 ight 2.97 eight 3.54 eight 32.04
# idxm. min_vo. Out[376 Returns Volatil: VET weig SNX weig VRA weig ALGO we: ADA weig LINK we: MANA we: CHZ weig Name: 59	5.579862 Lity 1.029582 Light 0.053241 Light 0.110525 Light 0.072691 Light 0.085511 Light 0.455343 Light 0.495343 Light 0.004702 Light 0.098296
In [385 win_volumn_v	pl_port.round(2) light 5.32 light 11.05 light 7.27 right 8.55 light 45.53 right 45.53 right 9.83