Karlsruher Institut für Technologie

Problem Set 1
Portfolio Allocation

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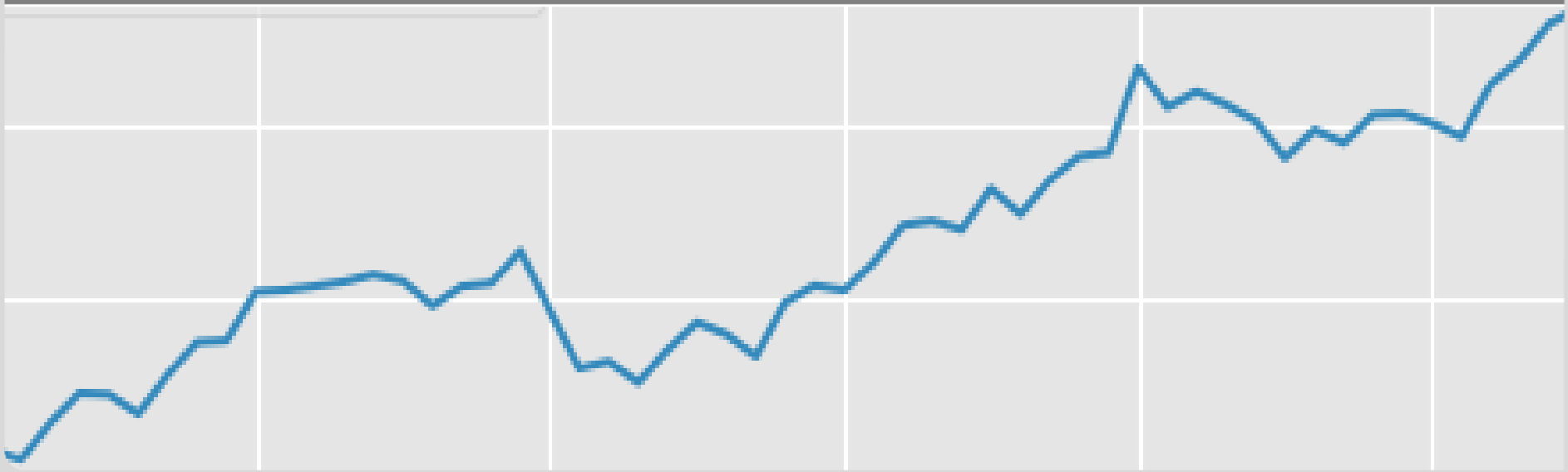
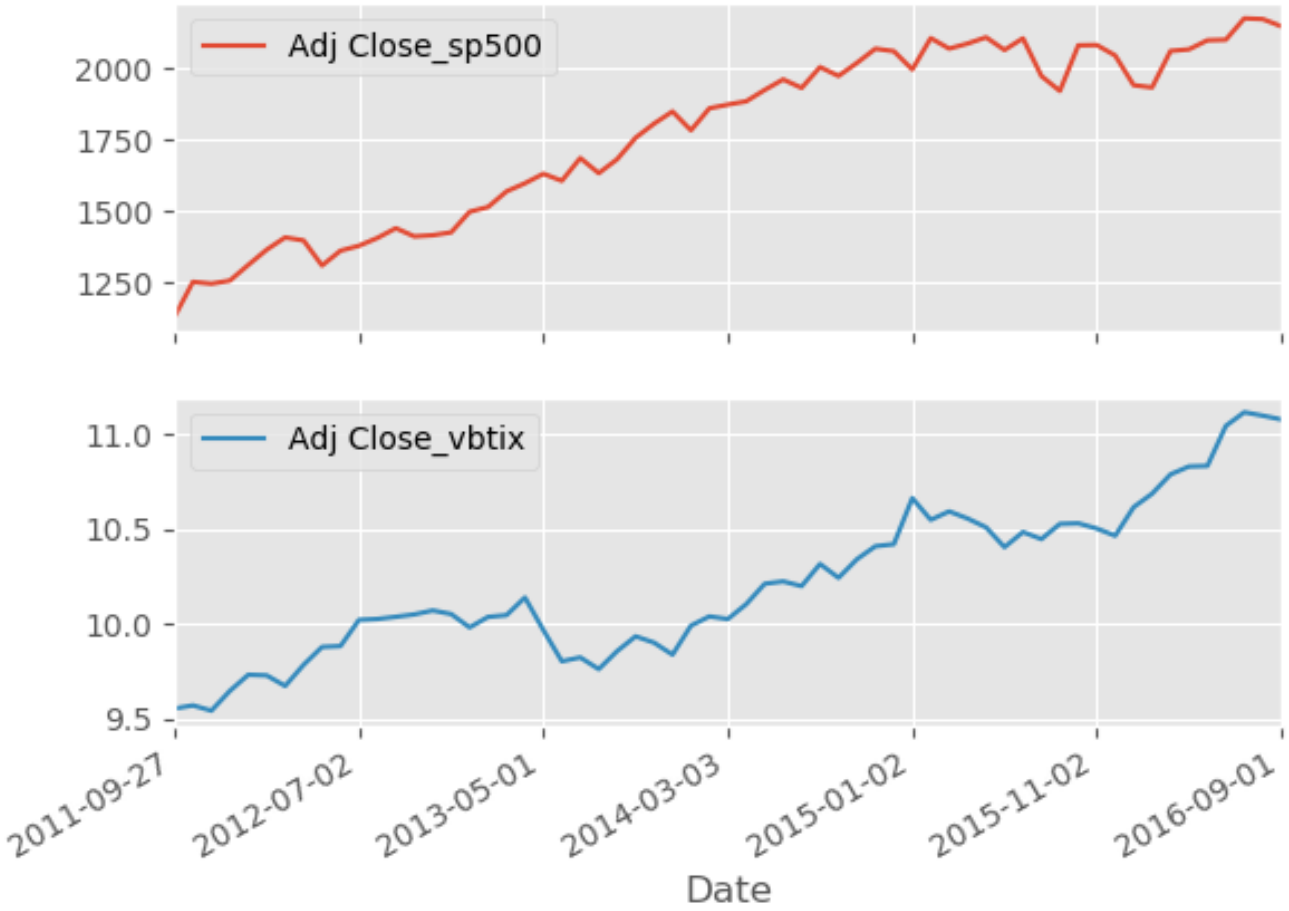
CRAM-Programming Lab WS 2017/18

FBV, Chair of Financial Economics and Risk Management



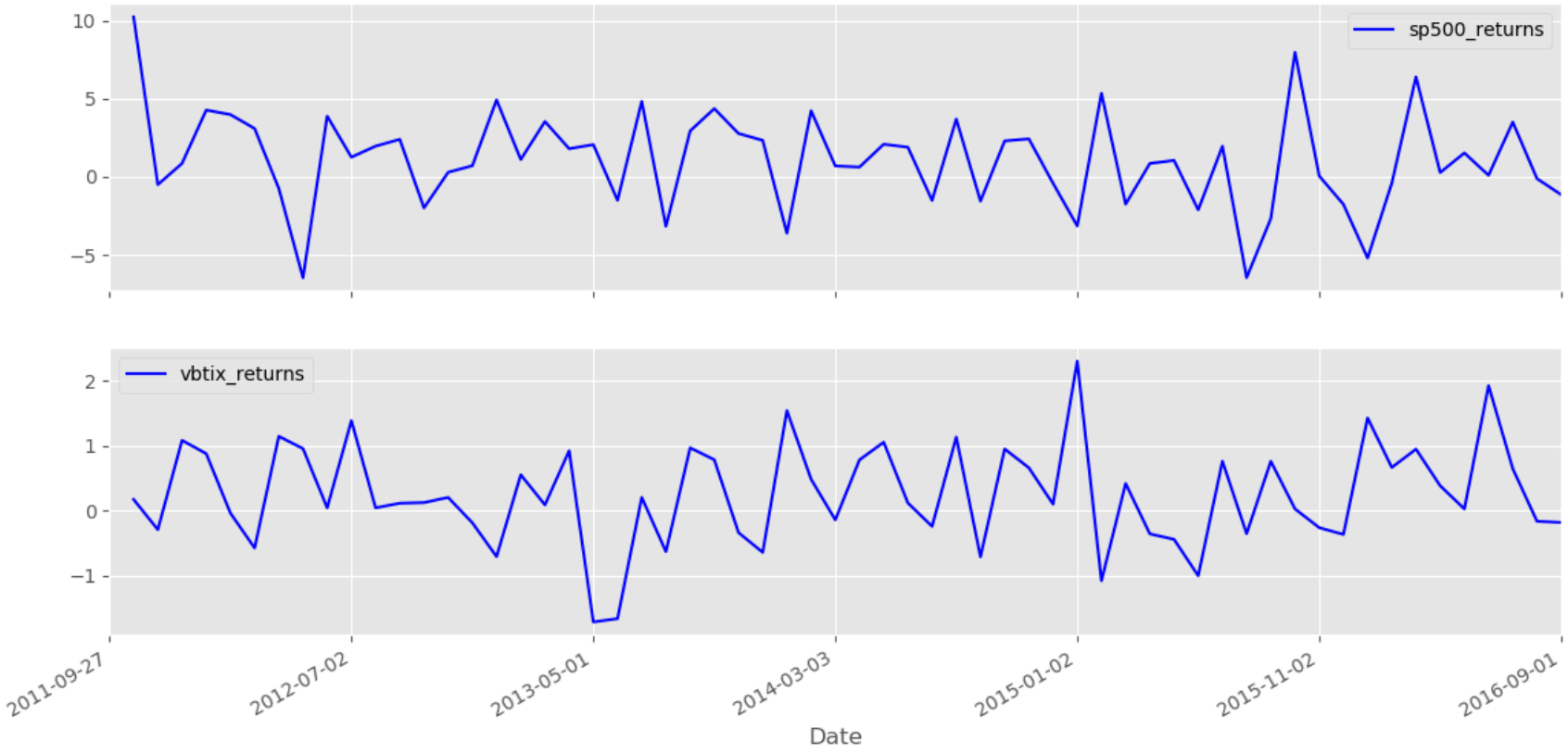
Question 1a: Data Management



Question 1a: Data Management

- Overall, both time series show an increasing trend over 5 years with a slight decline in the course of 2015
- However, there is a small difference in the end of 2013 where the stock of S&P 500 increases while the VBTIX decreases

Question 1b: Asset Returns



Question 1b: Asset Returns

	S&P 500	VBTIX
Ann. Mean	12.80	2.96
Ann. Std. Dev.	11.02	2.77
Correlation	-0.07	

Asset Returns

Question 1c: Investment Opportunity Set

	S&P 500	VBTIX
Variance	121.3630	7.6521
Covariance	-2.2732	

Investment Opportunity Set

Question 1d: Minimum Variance Portfolio

(1)

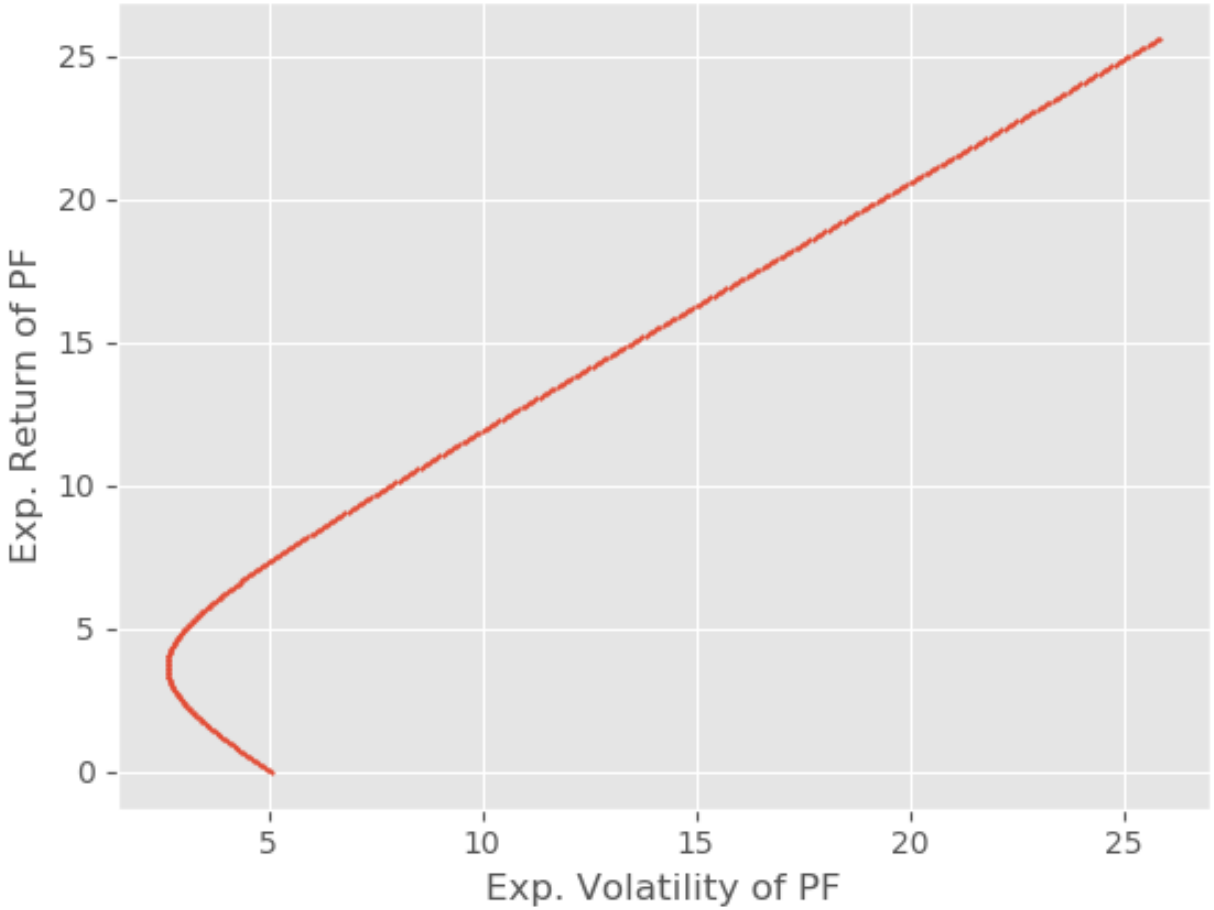
	S&P 500	VBTIX
Weights	0.07	0.93
Exp. Return	3.69	
Exp. Volatility	6.91	

(2)

Ann. Mean	12.80	2.96
Ann. Std. Dev.	11.02	2.77

Minimum Variance Portfolio (1), Return and risk profile (2)

Question 1e: Efficient frontier



Question 1f: Tangency Portfolio

		S&P 500	VBTIX
(1)	Weights	0.24	0.76
	Exp. Return	5.29	
	Exp. Volatility	3.23	
	Exp. Sharpe Ratio	1.48	
(2)	Ann. Mean	12.80	2.96
	Ann. Std. Dev.	11.02	2.77
(3)	Weights	0.07	0.93
	Exp. Return	3.69	
	Exp. Volatility	6.91	

Tangency Portfolio (1), Return and risk profile (2), Minimum Variance Portfolio (3)

Question 1f: Tangency Portfolio