Chapter 9, part a

The All Portfolios has a higher E(return)

portfolios	Sharpe Ratios	return
ETF	1.3537	0.0777
Comm	0.2658	0.0781
All	1.3783	0.0832

Table 1: Sharpe Ratios

Chapter 9, part b

portfolios	w.SPY	w.IWM	w.AGG	w.FEZ	w.ACWI	w.IYR
ETF	1.0000	0.0523	0.7514	(0.1021)	(0.5954)	(0.1062)

portfolios	w.WTI	w.AU	w.CU	w.Corn
Comm	(0.3548)	0.4439	(0.0891)	1.0000

portfolios	w.SPY	w.IWM	w.AGG	w.FEZ	w.ACWI	w.IYR	w.WTI
All	1.0000	0.0378	0.6825	(0.1127)	(0.5273)	(0.1141)	(0.0283)

portfolios	w.AU	w.CU	w.Corn
All	0.0157	0.0037	0.0499

Table 2: Portfolios weight

those portfolios have a higher Sharpe Ratios which mean with the same level of risk taking the return are higher. In terms of E[return] is much higher than risk free rate. In each of the three Portfolios there is one section weight 1.

Chapter 9, part c

portfolios	Sharpe Ratios	return
ETF	0.9119	0.0550
Comm	0.2160	0.0586
All	0.9273	0.0616

portfolios	w.SPY	w.IWM	w.AGG	w.FEZ	w.ACWI	w.IYR
ETF	0.3873	0.0000	0.6127	(0.0000)	0.0000	(0.0000)

portfolios	w.WTI	w.AU	w.CU	w.Corn
Comm	0.0000	(0.0000)	0.0000	1.0000

portfolios	w.SPY	w.IWM	w.AGG	w.FEZ	w.ACWI	w.IYR	w.WTI
All	0.4317	0.0000	0.5271	(0.0000)	(0.0000)	0.0000	0.0000

portfolios	w.AU	w.CU	w.Corn
All	0.0000	0.0000	0.0413

Table 3: Portfolios weight with min 0

When set min >=0 it limits the possibilities range of each portfolios, because it doesn't allow short. Overall the Sharpe Ratios and return are lower. By observing the portfolios weight there are may section weight close to zero.

Chapter 12, part a

eigenvectors

	PC1	PC2	PC3	PC4	PC5
T3M	0.039355	-0.27812	0.723718	-0.52165	0.349589
T6M	0.068119	-0.34177	0.458055	0.310244	-0.75097
T1Y	0.119864	-0.37845	0.104743	0.726927	0.530008
T2Y	0.279606	-0.54092	-0.33672	-0.18639	0.060229
T5Y	0.457308	-0.3153	-0.28329	-0.21761	-0.11383
T10Y	0.489525	0.060959	-0.02526	-0.05102	-0.09106
T20Y	0.483835	0.32757	0.145179	0.072362	0.028843
T30Y	0.467334	0.399486	0.200244	0.115238	0.08496

eigenvalues

7.66E-07	8.15E-08	4.40E-08	2.24E-08	1.53E-08

Table 4: top 5 eigenvalues and corresponding eigenvectors.

Chapter 12, part b

for eigenvectors principle component 1 and 2 holds the pattern where higher the Maturity higher the value, with some noise T3M's PC2 is higher than T6M's PC2. PC4 and higher are mostly noise data. From the pattern Long-run treasuries have a heavier weight to yield change.

Chapter 14, part a

all

	BA.xs.Est	BA.xs.pt	GD.xs.Est	GD.xs.pt	HON.xs.Est	HON.xs.pt	LMT.xs.Est	LMT.xs.pt
(Intercept)	0.000721	3.98E-02	0.000191	4.89E-01	0.000281	1.97E-01	0.000443	1.16E-01
alldata.xs[, 1]	1.269890	1.93E-46	1.001946	1.58E-46	1.107049	2.44E-82	0.845577	2.69E-33
alldata.xs[, 2]	(0.121708)	7.51E-02	(0.088849)	9.92E-02	(0.083525)	4.94E-02	(0.139894)	1.11E-02

	NOC.xs.Est	NOC.xs.pt	QCOM.xs.Est	QCOM.xs.pt	RTN.xs.Est	RTN.xs.pt	UTX.xs.Est	UTX.xs.pt
(Intercept)	0.000594	5.81E-02	(0.000364)	4.69E-01	0.000474	1.19E-01	0.000022	9.33E-01
alldata.xs[, 1]	0.900063	6.25E-31	1.163879	5.05E-21	0.887158	8.80E-32	0.944636	1.84E-46
alldata.xs[, 2]	(0.088930)	1.45E-01	(0.026030)	7.91E-01	(0.140149)	1.82E-02	(0.031744)	5.32E-01

SPX

	BA.xs.Est	BA.xs.pt	GD.xs.Est	GD.xs.pt	HON.xs.Est	HON.xs.pt	LMT.xs.Est	LMT.xs.pt
(Intercept)	0.000725	3.89E-02	0.000194	4.82E-01	0.000284	1.93E-01	0.000448	1.14E-01
alldata.xs[, 1]	1.141325	5.29E-116	0.908091	9.83E-118	1.018818	3.22E-194	0.697802	1.38E-74

	NOC.xs.Est	NOC.xs.pt	QCOM.xs.Est	QCOM.xs.pt	RTN.xs.Est	RTN.xs.pt	UTX.xs.Est	UTX.xs.pt
(Intercept)	0.000597	0.05698297	(0.000363)	0.4700245	0.000478	0.1165738	0.000023	0.9302719
alldata.xs[, 1]	0.806123	5.56E-80	1.136382	2.36E-64	0.739114	1.39E-72	0.911104	2.26E-129

RUT

	BA.xs.Est	BA.xs.pt	GD.xs.Est	GD.xs.pt	HON.xs.Est	HON.xs.pt	LMT.xs.Est	LMT.xs.pt
(Intercept)	0.000879578	2.36E-02	0.000316	3.01E-01	0.000419	1.10E-01	0.000549	7.05E-02
alldata.xs[, 2]	0.760993013	4.41E-72	0.607604	1.25E-73	0.685985	1.25E-114	0.447867	1.88E-44

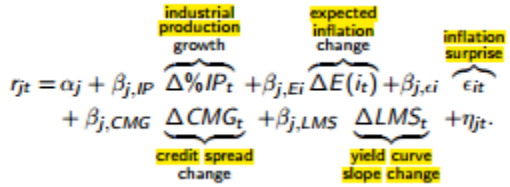
	NOC.xs.Est	NOC.xs.pt	QCOM.xs.Est	QCOM.xs.pt	RTN.xs.Est	RTN.xs.pt	UTX.xs.Est	UTX.xs.pt
(Intercept)	0.000706	3.50E-02	(0.000219)	6.77E-01	0.000584	7.27E-02	0.000139542	6.29E-01
alldata.xs[, 2]	0.536704	2.83E-51	0.782983	4.76E-45	0.476516	9.05E-44	0.624873472	7.69E-85

Summery In this model the t-stats are low only GD's, QCOM lm and UTX's lm have high Pr(>|t|) value (the green col means higher t-state p value). When there have both SPX and RUT SPX weight more. (red)

Chapter 14, part b

From the finding when there is both SPX and RUT(multi-factor), SPX are always weight more which make sense all the stock in the portfolios relate to large cap in US so there should be a large correlation between them. That is also why confidence level is higher with SPX only. But even CAMP is a good model because there is only one risk factor it can't simulate market as good. That is why overall Pr(>|t|) is not high.

Chapter 15, part a (4)



$$r_{jt} = \alpha_j + \beta_{j,IP}\,\Delta\%IP_t + \beta_{j,Ei}\,\Delta E(i_t) + \beta_{j,ci}\,\epsilon_{it} + \beta_{j,CMG}\,\Delta CMG_t + \beta_{j,LMS}\,\Delta LMS_t + \eta_{jt}.$$

	SPX.xs.Est	SPX.xs.t	RUT.xs.Est	RUT.xs.t	BA.xs.Est	BA.xs.t	GD.xs.Est	GD.xs.t
(Intercept)	-7.96E-04	0.960066	-3.41E-03	0.8616152	9.54E-03	0.7357842	3.30E-03	0.8828714
Indprod	-2.66E-02	0.6129906	-6.70E-02	0.3002956	-1.37E-01	0.1411778	-7.10E-02	0.3371867
Ex infl diff	-1.04E-02	0.8569189	1.98E-02	0.7800689	-3.61E-02	0.7251038	1.56E-02	0.8475243
Infl surp	3.22E-02	0.3532617	4.74E-02	0.2682236	1.19E-02	0.8475264	5.78E-02	0.2376872
BAA-T10	9.62E-06	0.9475036	3.30E-05	0.854727	-5.50E-05	0.8323003	-4.10E-05	0.842319
T30-T3m	1.01E-02	0.8692956	2.03E-02	0.7877642	-1.19E-01	0.274767	7.32E-02	0.3962367

	HON.xs.Est	HON.xs.t	LMT.xs.Est	LMT.xs.t	NOC.xs.Est	NOC.xs.t	QCOM.xs.Est	QCOM.xs.t
(Intercept)	-7.80E-03	0.7111824	-3.29E-05	0.9987367	1.04E-02	0.6530745	1.40E-02	0.6970326
Indprod	-3.88E-02	0.5770211	-8.06E-02	0.240562	-8.19E-02	0.2861783	-1.45E-01	0.221453
Ex infl diff	1.96E-02	0.7979872	-6.07E-03	0.9358776	-1.10E-01	0.1911889	9.19E-02	0.4815743
Infl surp	6.87E-02	0.1360197	2.31E-02	0.6112535	-1.37E-02	0.7868135	-7.80E-04	0.9920757
BAA-T10	6.82E-05	0.7248851	4.20E-06	0.9824499	-8.98E-05	0.6741985	-8.78E-05	0.7907101
T30-T3m	6.78E-02	0.4040261	1.53E-02	0.848071	-9.01E-03	0.9198974	-2.20E-01	0.1126422

	RTN.xs.Est	RTN.xs.t	UTX.xs.Est	UTX.xs.t
(Intercept)	9.96E-03	0.6554046	1.16E-03	0.9571367
Indprod	-3.28E-02	0.6565117	-1.08E-01	0.1322165
Ex infl diff	2.52E-02	0.7558242	-2.09E-02	0.7898299
Infl surp	8.59E-05	0.9985938	5.29E-02	0.2631434
BAA-T10	-8.59E-05	0.6755786	-5.98E-07	0.9975998
T30-T3m	-1.25E-02	0.8843037	-2.86E-02	0.731993

Chapter 15, part b (4)

There are high Pr(>|t|) value (green) so there is high confidence that it is >|t|. The coefficient of the model is low for most of them. Which mean low Est high sigma over all this model is not a good fit for the return.

Chapter 15, part a (5)

	SPX.xs.Est	SPX.xs.t	RUT.xs.Est	RUT.xs.t	BA.xs.Est	BA.xs.t	GD.xs.Est	GD.xs.t
mu	0.000709	8.65E-05	0.000465	0.09762437	0.001327	0.001498195	0.000613	7.44E-02
omega	0.000004	6.12E-08	0.000010	0	0.000026	0.006371395	0.000023	1.43E-02
alpha1	0.214635	0.00E+00	0.123862	0	0.108448	0.002065443	0.095921	3.42E-03
beta1	0.721114	0.00E+00	0.776553	0	0.769410	0	0.722721	8.90E-14

	HON.xs.Est	HON.xs.t	LMT.xs.Est	LMT.xs.t	NOC.xs.Est	NOC.xs.t	QCOM.xs.Est	QCOM.xs.t
mu	0.000850	4.24E-03	0.000900	0.003456983	0.001007	0.002510788	0.000042	0.9424988
omega	0.000005	4.22E-15	0.000002	0.102295827	0.000001	0.340967016	0.000002	0
alpha1	0.090927	6.88E-15	0.032689	0	0.037744	0.00072258	0.000174	0
beta1	0.865718	0.00E+00	0.946450	0	0.952775	0	0.993884	0

	RTN.xs.Est	RTN.xs.t	UTX.xs.Est	UTX.xs.t
mu	0.000780	1.69E-02	0.000573	0.07532958
omega	0.000021	3.25E-02	0.000011	0
alpha1	0.122039	1.97E-03	0.091381	0
beta1	0.720231	5.23E-12	0.822184	0

Chapter 15, part b (5)

	SPX	RUT	BA	GD	HON	LMT	NOC	QCOM	RTN	UTX
"-LLH"	-3552.81	-3235.952	-2866.135	-3079.662	-3167.814	-3164.823	-3064.526	-2582.654	-3092.345	-3125.069

This model work better it a small p value which mean high CI that the coefficient is right. For this model betal1 always weight the most.

It's log likelihood is high (LLH). Higher the LLH more accuracy the model

Chapter 15, part a (6)

	BA.xs.Est	BA.xs.t	GD.xs.Est	GD.xs.t	HON.xs.Est	HON.xs.t	LMT.xs.Est	LMT.xs.t
(Intercept)	0.000746	2.59E-03	0.000230	2.39E-01	0.000255	0.1079216	0.000452	2.33E-02
SPX	1.141541	1.07E-230	0.907906	9.61E-234	1.022100	0	0.693854	1.15E-146
SMB	(0.000143)	7.69E-01	(0.000291)	4.51E-01	(0.000295)	0.3455922	(0.000495)	2.09E-01
HML	0.000755	1.21E-01	0.000851	2.66E-02	0.000442	0.1554768	(0.000982)	1.22E-02

	NOC.xs.Est	NOC.xs.t	QCOM.xs.Est	QCOM.xs.t	RTN.xs.Est	RTN.xs.t	UTX.xs.Est	UTX.xs.t
(Intercept)	0.000610	5.76E-03	(0.000404)	2.55E-01	0.000485	2.40E-02	0.000061	7.40E-01
SPX	0.801930	2.99E-157	1.136313	5.81E-127	0.735573	1.75E-142	0.912177	4.41E-257
SMB	(0.000196)	6.54E-01	(0.000792)	2.59E-01	(0.000581)	1.71E-01	0.000350	3.36E-01
HML	(0.000786)	7.02E-02	(0.001209)	8.34E-02	(0.000487)	2.49E-01	0.001278	4.23E-04

Chapter 15, part b (6)

This model and CAPM model are agree SPX weight the most as Market R it have a very small p value. For most of them have a negative SMB and small weight of HML. The coefficient of the SPX is not much different from CAPM.

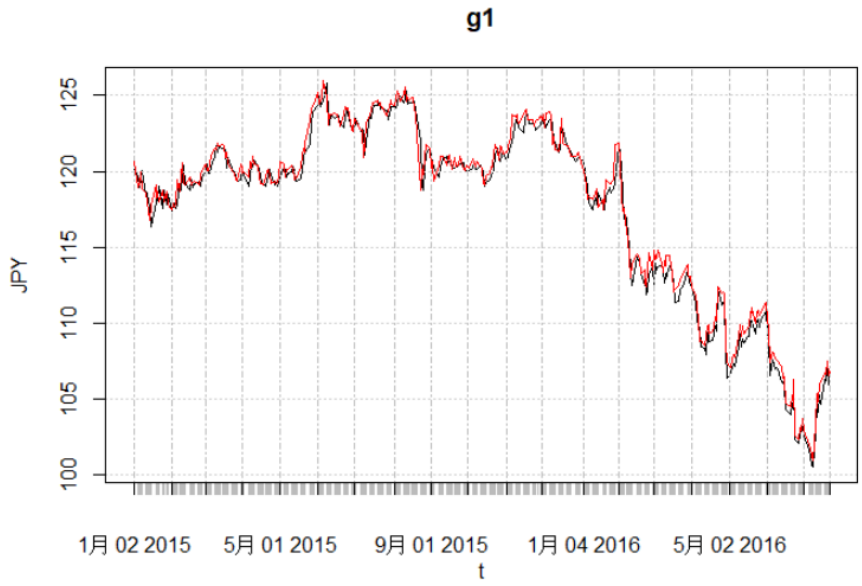
Chapter 18

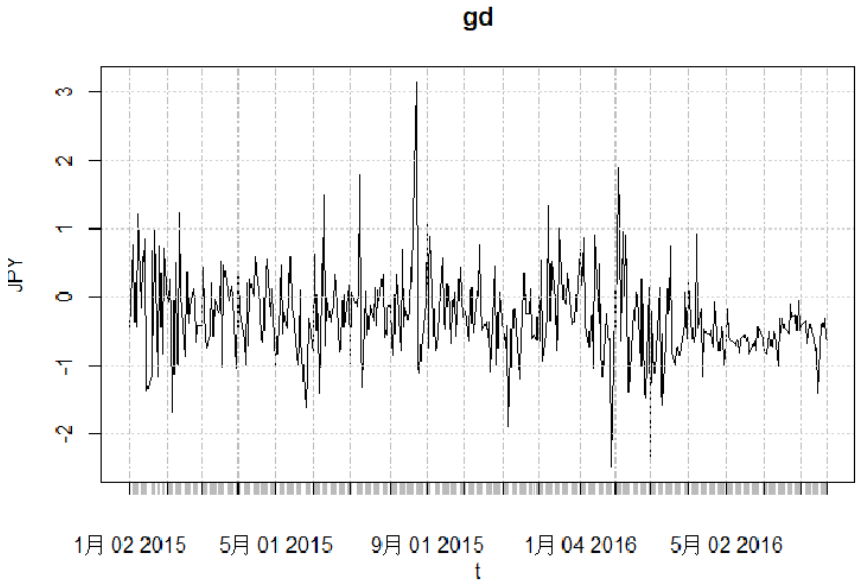
The different between JPY using 1 USD the invest in market. (JPY number easier to visual)

$$\left(1+\mathrm{r}_{\tau,\mathrm{USD}}\right)*X_{t,\frac{USD}{JPY}} \cong \left(1+\mathrm{r}_{\tau,\mathrm{JPY}}\right)*E\left(X_{t+\tau,\frac{USD}{JPY}}\right)$$

The JPY risk free rate miss data in this case I **omit** the missing data

Because we are looking for difference don't have to make up value.






```
> mean(gd)
[1] -0.272633
> sd(gd)
[1] 0.610984
> library(moments)
> skewness(gd,na.rm = T)
                0.704454
> kurtosis(gd,na.rm = T)
                6.201839
```

Chapter 22 part a

```
> result$par
[1] 0.3068807 0.9870448
> result$value
[1] 1599.768
```

Chapter 22 part b

The par value of the model fit is ~ 0.3 and 1 the payoff is high but the risk level is high too

Chapter 22 part c

To add a new risky factor. Or bootstrapping to find lower standard error.

Chapter 22 part d

Log return the model