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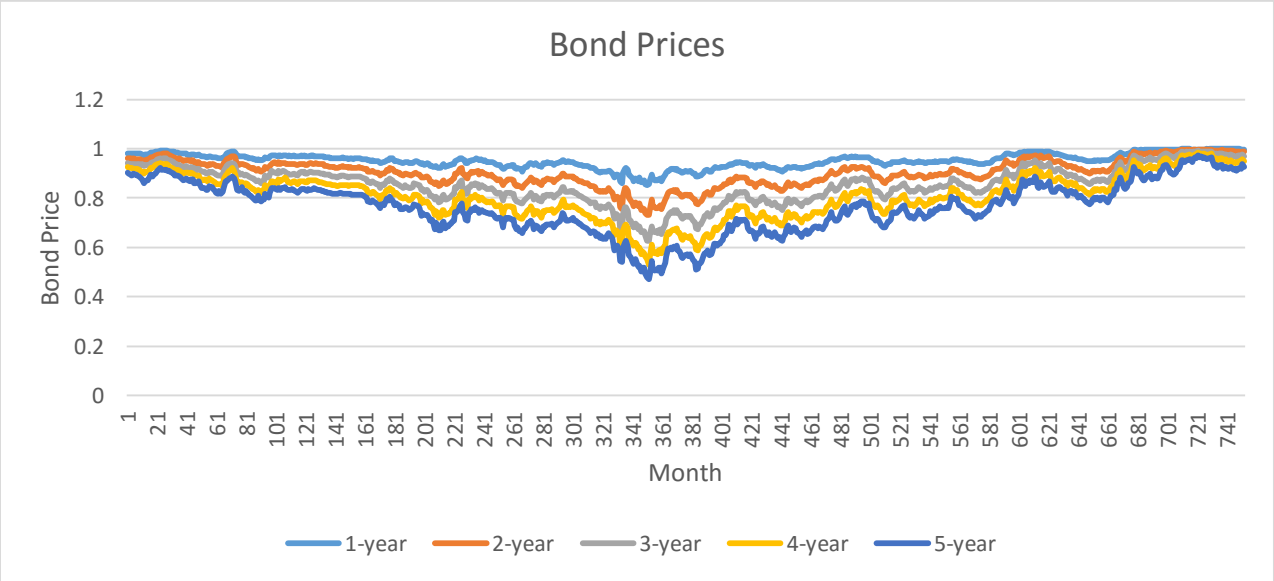
Financial Econometrics

Assignment 3

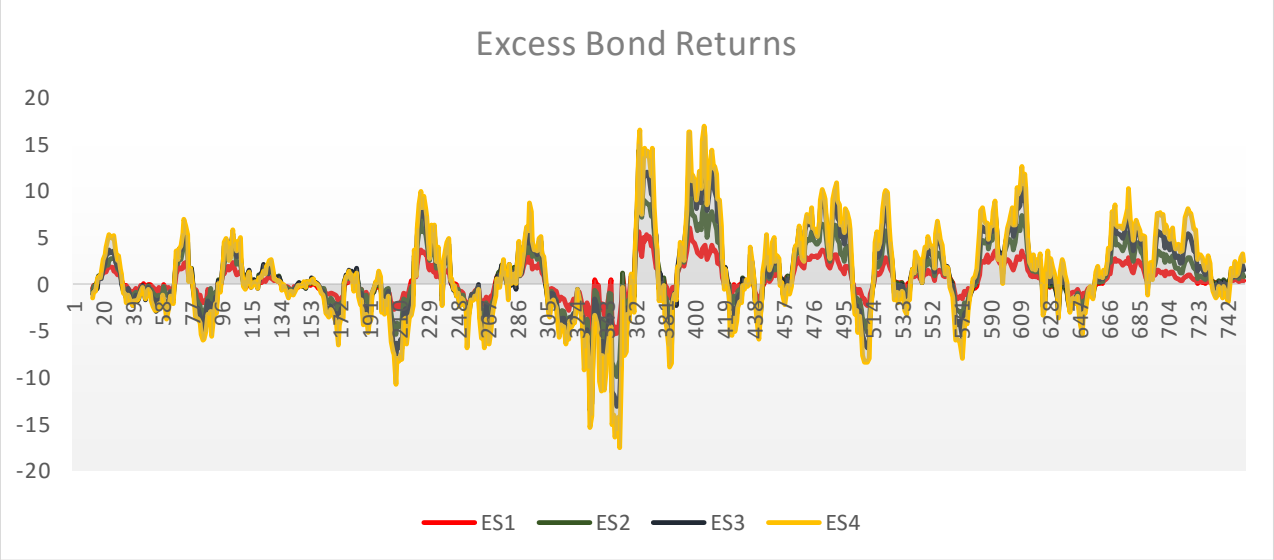
4/25/16

Question 1

A.



B.



C.

The following are linear regressions and Newey-West estimator results:

Linear regression

Number of obs	= 741
F(6, 734)	= 129.26
Prob > F	= 0.0000
R-squared	= 0.5235
Root MSE	= 1.1435

ES1	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
YTM1	-.9613479	.0790553	-12.16	0.000	-1.116549	-.8061464
f12	-.4306752	.1457702	-2.95	0.003	-.7168516	-.1444989
f23	.9324971	.1537879	6.06	0.000	.6305805	1.234414
f34	.2667452	.1395698	1.91	0.056	-.0072583	.5407488
f45	.2165648	.0959842	2.26	0.024	.0281284	.4050012
t	-.0001158	.0001888	-0.61	0.540	-.0004864	.0002548
_cons	-.6859436	.122609	-5.59	0.000	-.9266498	-.4452375

Linear regression

Number of obs	= 741
F(6, 734)	= 107.15
Prob > F	= 0.0000
R-squared	= 0.4792
Root MSE	= 2.1835

ES2	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
YTM1	-1.149752	.1546732	-7.43	0.000	-1.453406	-.8460971
f12	-1.766706	.2834814	-6.23	0.000	-2.323237	-1.210175
f23	1.922048	.297792	6.45	0.000	1.337422	2.506674
f34	.5948563	.2661031	2.24	0.026	.0724423	1.11727
f45	.3901537	.1879981	2.08	0.038	.0210757	.7592318
t	-.000071	.0003517	-0.20	0.840	-.0007615	.0006194
_cons	-.9053892	.2330085	-3.89	0.000	-1.362832	-.4479467

Linear regression

Number of obs	= 741
F(6, 734)	= 86.31
Prob > F	= 0.0000
R-squared	= 0.4229
Root MSE	= 3.1937

ES3	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
YTM1	-1.383661	.2281558	-6.06	0.000	-1.831577	-.9357452
f12	-2.192685	.4167673	-5.26	0.000	-3.010883	-1.374487
f23	1.987904	.4501981	4.42	0.000	1.104074	2.871733
f34	.9110069	.3967731	2.30	0.022	.1320615	1.689952
f45	.6202983	.2695941	2.30	0.022	.0910309	1.149566
t	.0005994	.0005048	1.19	0.235	-.0003917	.0015906
_cons	-1.135169	.3362718	-3.38	0.001	-1.795338	-.4749996

Linear regression

Number of obs	= 741
F(6, 734)	= 76.40
Prob > F	= 0.0000
R-squared	= 0.3898
Root MSE	= 4.0545

ES4	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
YTM1	-1.585066	.2848825	-5.56	0.000	-2.144347	-1.025784
f12	-2.499103	.5174275	-4.83	0.000	-3.514917	-1.483289
f23	2.470911	.553005	4.47	0.000	1.385251	3.556571
f34	.5847637	.4960238	1.18	0.239	-.3890309	1.558558
f45	.8843231	.3439494	2.57	0.010	.2090812	1.559565
t	.0013731	.0006463	2.12	0.034	.0001043	.0026419
_cons	-1.117042	.4197213	-2.66	0.008	-1.941039	-.2930446

Newey West:

Regression with Newey-West standard errors — Number of obs = 741
maximum lag: 4 — F(6, 734) = 39.37
Prob > F = 0.0000

ES1	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
YTM1	-.9613479	.1267611	-7.58	0.000	-1.210205	-.7124904
f12	-.4306752	.2125997	-2.03	0.043	-.8480512	-.0132993
f23	.9324971	.2119743	4.40	0.000	.5163488	1.348645
f34	.2667452	.1720107	1.55	0.121	-.0709464	.6044369
f45	.2165648	.1445131	1.50	0.134	-.0671435	.5002731
t	-.0001158	.0003637	-0.32	0.750	-.0008299	.0005982
_cons	-.6859436	.2355088	-2.91	0.004	-1.148295	-.2235925

Regression with Newey-West standard errors — Number of obs = 741
maximum lag: 4 — F(6, 734) = 33.45
Prob > F = 0.0000

ES2	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
YTM1	-1.149752	.2489214	-4.62	0.000	-1.638434	-.6610687
f12	-1.766706	.4180871	-4.23	0.000	-2.587495	-.9459167
f23	1.922048	.4165182	4.61	0.000	1.104339	2.739757
f34	.5948563	.3122841	1.90	0.057	-.0182201	1.207933
f45	.3901537	.2784334	1.40	0.162	-.156467	.9367745
t	-.000071	.000669	-0.11	0.915	-.0013845	.0012424
_cons	-.9053892	.4486415	-2.02	0.044	-1.786163	-.0246156

Regression with Newey-West standard errors — Number of obs = 741
maximum lag: 4 — F(6, 734) = 25.74
Prob > F = 0.0000

ES3	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
YTM1	-1.383661	.374407	-3.70	0.000	-2.118697	-.6486248
f12	-2.192685	.6300582	-3.48	0.001	-3.429616	-.9557538
f23	1.987904	.6121092	3.25	0.001	.7862101	3.189597
f34	.9110069	.4786498	1.90	0.057	-.028679	1.850693
f45	.6202983	.4019208	1.54	0.123	-.1687531	1.40935
t	.0005994	.0009505	0.63	0.528	-.0012665	.0024654
_cons	-1.135169	.6516604	-1.74	0.082	-2.414509	.1441717

Regression with Newey-West standard errors — Number of obs = 741
maximum lag: 4 — F(6, 734) = 22.18
Prob > F = 0.0000

ES4	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
YTM1	-1.585066	.4754759	-3.33	0.001	-2.51852	-.6516108
f12	-2.499103	.7948212	-3.14	0.002	-4.059497	-.9387092
f23	2.470911	.754312	3.28	0.001	.9900448	3.951777
f34	.5847637	.6090827	0.96	0.337	-.6109882	1.780516
f45	.8843231	.5127665	1.72	0.085	-.1223407	1.890987
t	.0013731	.0012139	1.13	0.258	-.0010101	.0037562
_cons	-1.117042	.8091126	-1.38	0.168	-2.705493	.4714089

The regressions show that Yield to Maturity is generally a good estimator since its p-value is less than 0.05 for all excess returns. However, the forwards prices are less accurate. For the Excess returns at Tau=1 through 4, the forwards 1,2 and 2,3 have p-values less than 0.05. However, the forwards 3,4 and 4,5 lose their predictability.

According to the expectations hypothesis, the estimates in the regression should not be statistically different than 0. However, the estimated coefficients are significant, and the forward rates seem to predict excess returns. The R^2 for the regressions are large. This means there is strong empirical evidence against the expectations hypothesis.

The forward yield on future bond become less accurate predictors of the excess yields. These regressions and Newey-West estimates indicate that the expectations hypothesis is false. The expectations hypothesis doesn't take into account the risk of holding long term bonds, and as a result these results indicate that such prior information will not

accurately predict the excess yields. The rejection is most likely due to the presence of time-varying risk premia.

D.

```
. newey spread1 gamma1 t, lag(4)

Regression with Newey-West standard errors      Number of obs     =        741
maximum lag: 4                                  F(  2,      738)  =       5.88
                                                Prob > F          =     0.0029
```

spread1	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
gamma1	-.4014376	.3395861	-1.18	0.238	-1.068108	.2652324
t	-.0012121	.0004329	-2.80	0.005	-.002062	-.0003622
_cons	.2984007	.1947037	1.53	0.126	-.0838385	.6806399

```
. newey spread2 gamma2 t, lag(4)

Regression with Newey-West standard errors      Number of obs     =        741
maximum lag: 4                                  F(  2,      738)  =       7.21
                                                Prob > F          =     0.0008
```

spread2	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
gamma2	-.6985031	.4023865	-1.74	0.083	-1.488462	.0914555
t	-.0010707	.000392	-2.73	0.006	-.0018403	-.000301
_cons	.3231254	.173512	1.86	0.063	-.0175105	.6637613

```
. newey spread3 gamma3 t, lag(4)

Regression with Newey-West standard errors      Number of obs     =        741
maximum lag: 4                                  F(  2,      738)  =      10.50
                                                Prob > F          =     0.0000
```

spread3	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
gamma3	-1.032034	.4405619	-2.34	0.019	-1.896938	-.1671302
t	-.0010247	.0003644	-2.81	0.005	-.0017402	-.0003093
_cons	.3953058	.1550392	2.55	0.011	.0909353	.6996763

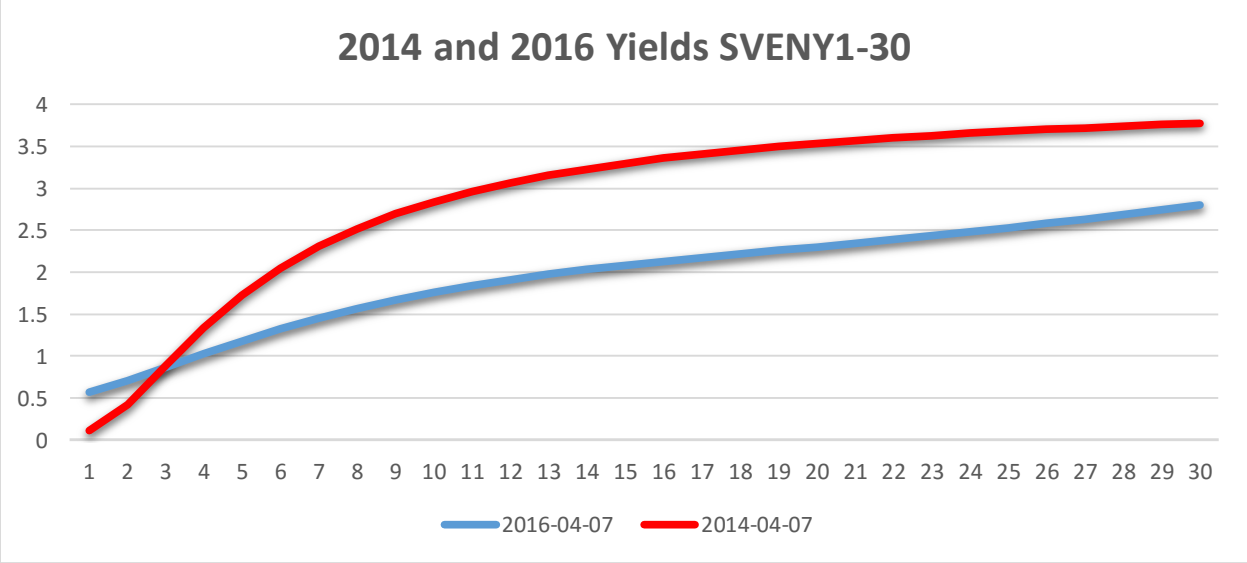
```
. newey spread4 gamma4 t, lag(4)

Regression with Newey-West standard errors      Number of obs     =        741
maximum lag: 4                                  F(  2,        738) =      10.77
                                                Prob > F          =     0.0000
```

spread4	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
gamma4	-1.032769	.4777753	-2.16	0.031	-1.970729	-.0948081
t	-.0009715	.0003425	-2.84	0.005	-.0016439	-.0002992
_cons	.4049288	.1431687	2.83	0.005	.1238624	.6859952

Reject hypothesis since the hypothesis is gamma = 1, but none have coefficients equal to 1. In fact, they all have negative correlations. The expectations hypothesis predicts that the slope of the yield curve ought to be steep and that future long-term interest rates should rise. However, the regressions show that the rates are actually falling. This implies that there are time-varying bond risk and term premia. The p values for each of these regressions except for the first spread seem to imply some level of statistical significance.

This data once again suggests that we should reject the expectations hypothesis

E.

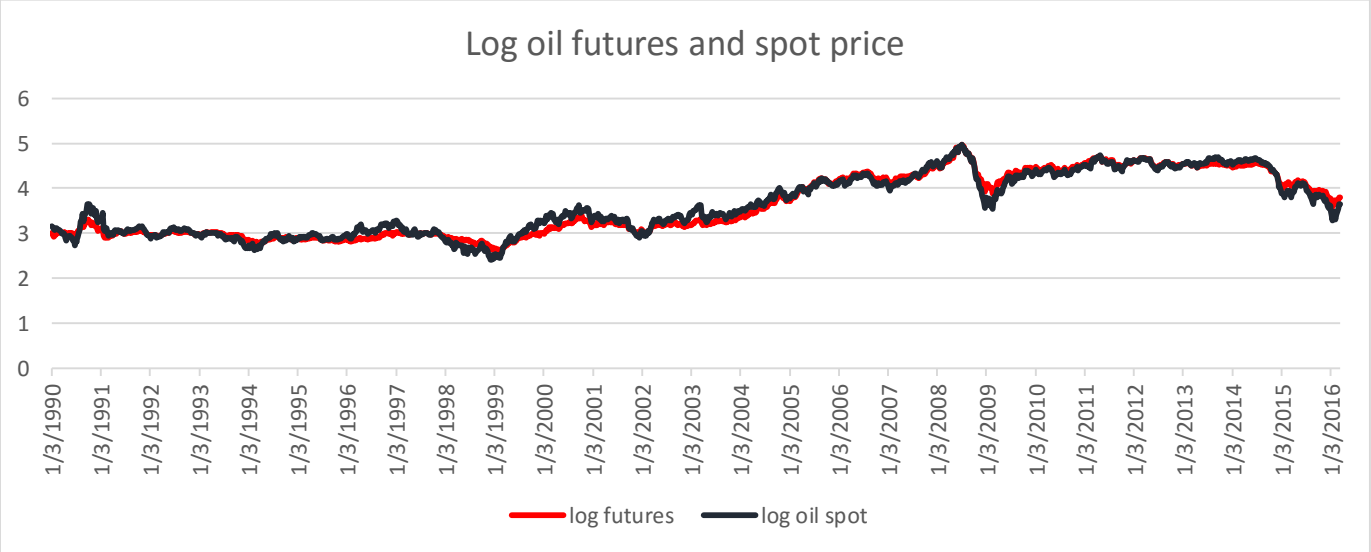


These yield curves indicate that as years to maturity increase, there are increasing yet diminishing yields to coupon bonds. So, they both have positive slopes but relatively flat slopes. The curves show. The curvature for 4-7-2016 is much flatter, but it has some slight curvature that shows higher yields in the long term. The curve for 4-7-2014 shows

more curvature because of low yields in the short term higher yield levels in the long term.

Question 2.

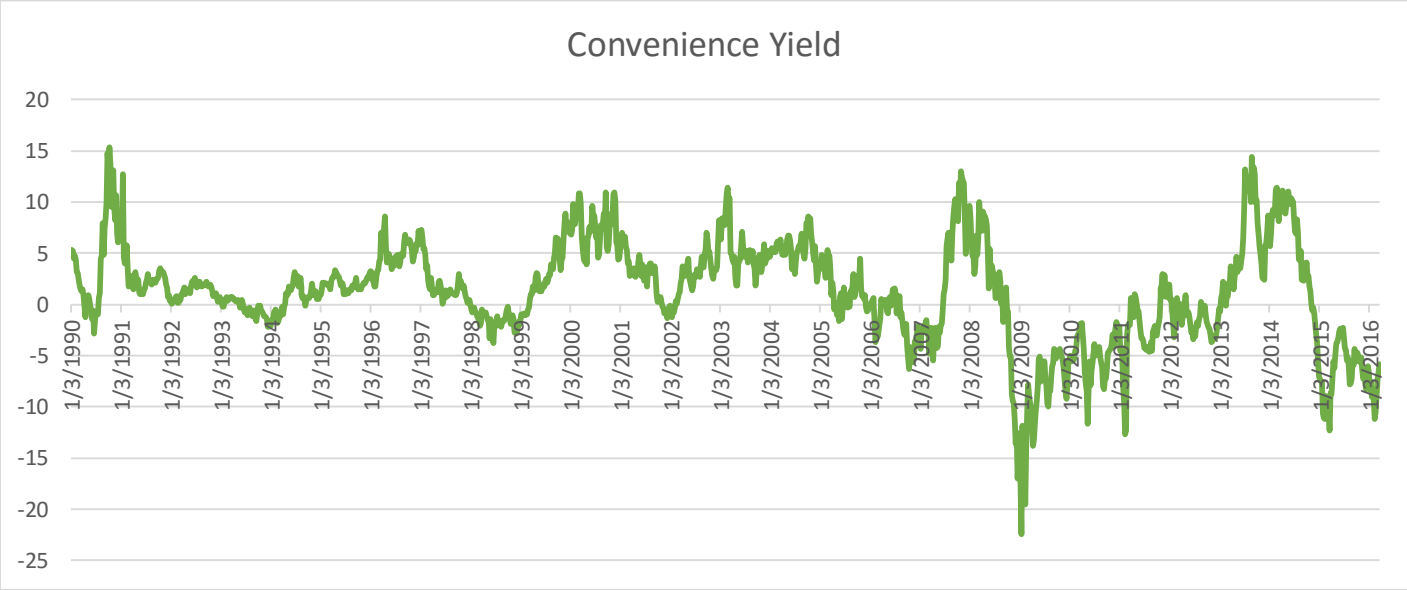
A.



This graph would seem to indicate that futures and spot prices are pretty strongly correlated with one another. However, there are varying periods of backwardation and contango where the curves overlap each other. Generally, in periods of financial decline or when oil prices decline, there are periods of backwardation. When there are periods of uncertainty, there is contango.

Some points of interest on this graph include a period between 1990 and 1991 as well as in 2008. The spike in spot and futures prices in the early 90s could easily be attributed to the Gulf War. During the Gulf War, oil price expectations soared after the Kuwaiti oil well fires. Additionally, the 2008 financial crisis could be used to explain the steep decline in prices. Recent drops in oil prices could be due to advancements in technology that have made the supply of oil much cheaper.

B.



The oil market was mostly in backwardation over this period of time since the convenience yield is positive for the majority of this time period.

C.

```
. newey ScaleChange CYS yearyield t, lag(4)

Regression with Newey-West standard errors      Number of obs     =      1,316
maximum lag: 4                                  F(  3,     1312)  =      13.09
                                                Prob > F          =     0.0000
```

ScaleChange	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
CYS	-1.166703	.1940693	-6.01	0.000	-1.547423	-.7859833
yearyield	.013344	.015887	0.84	0.401	-.0178227	.0445106
t	-.0000744	.0000931	-0.80	0.424	-.0002571	.0001083
_cons	.1447866	.1069605	1.35	0.176	-.0650456	.3546188

The p-value for the CY/S coefficient is 0 which is less than 0.05 meaning that is statistically significant. However, the p value for the 1-year yield is 0.4 which is greater than 0.05 meaning it is not statistically significant.

The convenience yield is a fairly good predictor of future changes in the spot price of oil. The expected discounted future flow of convenience yields does a good job determining the spot commodity price. The convenience yield often plays the role of dividend because of this.