Test Exercise 3

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(a) Use general-to-specific to come to a model. Start by regressing the federal funds rate on the other 7 variables and eliminate 1 variable at a time.

```
reg.lm <- lm("INTRATE ~ INFL + PROD + UNEMPL + COMMPRI + PCE + PERSINC + HOUST", data)
pretty <- prettify(summary(reg.lm))
kable(pretty)
```

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.2211609	-0.7022347	0.2599129	0.2449947	-0.9027172	0.367	
INFL	0.6960592	0.5738661	0.8182523	0.0622288	11.1854756	<0.001	***
PROD	-0.0577431	-0.1360918	0.0206056	0.0399004	-1.4471824	0.148	
UNEMPL	0.1024814	-0.0875119	0.2924746	0.0967572	1.0591603	0.29	
COMMPRI	-0.0055211	-0.0113604	0.0003183	0.0029738	-1.8565634	0.064	.
PCE	0.3443801	0.2079972	0.4807629	0.0694552	4.9583061	<0.001	***
PERSINC	0.2469988	0.1280245	0.3659731	0.0605896	4.0765864	<0.001	***
HOUST	-0.0194113	-0.0285844	-0.0102383	0.0046715	-4.1552303	<0.001	***

We remove PROD as it has the higher t value.

```
reg.lm <- lm("INTRATE ~ INFL + UNEMPL + COMMPRI + PCE + PERSINC + HOUST", data)
pretty <- prettify(summary(reg.lm))
kable(pretty)
```

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.2459818	-0.7262758	0.2343123	0.2445983	-1.005656	0.315	
INFL	0.7160629	0.5968229	0.8353029	0.0607251	11.791879	<0.001	***
UNEMPL	-0.0044833	-0.1271959	0.1182293	0.0624936	-0.071740	0.943	
COMMPRI	-0.0074894	-0.0126866	-0.0022922	0.0026468	-2.829629	0.005	**
PCE	0.3431384	0.2066522	0.4796247	0.0695081	4.936671	<0.001	***
PERSINC	0.2410714	0.1222702	0.3598727	0.0605016	3.984543	<0.001	***
HOUST	-0.0206276	-0.0296586	-0.0115967	0.0045992	-4.485072	<0.001	***

We remove UNEMPL as it has the higher t value.

```
reg.lm <- lm("INTRATE ~ INFL + COMMPRI + PCE + PERSINC + HOUST", data)
pretty <- prettify(summary(reg.lm))
kable(pretty)
```

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.2401188	-0.6924651	0.2122275	0.2303660	-1.042336	0.298	
INFL	0.7175265	0.6053036	0.8297495	0.0571517	12.554771	<0.001	***
COMMPRI	-0.0075007	-0.0126847	-0.0023167	0.0026401	-2.841100	0.005	**
PCE	0.3405254	0.2243669	0.4566840	0.0591560	5.756400	<0.001	***
PERSINC	0.2402420	0.1237191	0.3567649	0.0593415	4.048463	<0.001	***
HOUST	-0.0205297	-0.0291472	-0.0119121	0.0043887	-4.677900	<0.001	***

We remove COMMPRI as it has the higher t value.

```
reg.lm <- lm("INTRATE ~ INFL + PCE + PERSINC + HOUST", data)
pretty <- prettify(summary(reg.lm))
kable(pretty)
```

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.2135714	-0.6679775	0.2408347	0.2314157	-0.9228905	0.356	
INFL	0.7448085	0.6335857	0.8560314	0.0566425	13.1492793	<0.001	***
PCE	0.3109752	0.1960109	0.4259395	0.0585480	5.3114612	<0.001	***
PERSINC	0.2568855	0.1403078	0.3734631	0.0593696	4.3268857	<0.001	***
HOUST	-0.0215219	-0.0301584	-0.0128855	0.0043983	-4.8932529	<0.001	***

```
summary(reg.lm)
```

```
##
## Call:
## lm(formula = "INTRATE ~ INFL + PCE + PERSINC + HOUST", data = data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -6.8827 -1.5365 -0.1099  1.3049  7.7022
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.213571   0.231416  -0.923    0.356
## INFL         0.744809   0.056643  13.149  < 2e-16 ***
## PCE          0.310975   0.058548   5.311 1.49e-07 ***
## PERSINC      0.256885   0.059370   4.327 1.75e-05 ***
## HOUST       -0.021522   0.004398  -4.893 1.25e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.2 on 655 degrees of freedom
## Multiple R-squared:  0.6329, Adjusted R-squared:  0.6306
## F-statistic: 282.3 on 4 and 655 DF,  p-value: < 2.2e-16
```

Now all variables has high significance so we keep them.

(b) Use specific-to-general to come to a model. Start by regressing the federal funds rate on only a constant and add 1 variable at a time. Is the model the same as in (a)?

```
reg.lm <- lm("INTRATE ~ 1", data)
pretty <- prettify(summary(reg.lm))
kable(pretty)
```

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
(Intercept)	5.347636	5.071006	5.624267	0.1408815	37.95841	<0.001	***

```
reg.lm <- lm("INTRATE ~ INFL", data)
pretty <- prettify(summary(reg.lm))
kable(pretty)
```

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
(Intercept)	1.6420865	1.330604	1.953569	0.1586301	10.35167	<0.001	***
INFL	0.9453384	0.881163	1.009514	0.0326830	28.92451	<0.001	***

```
reg.lm <- lm("INTRATE ~ INFL + PROD", data)
pretty <- prettify(summary(reg.lm))
kable(pretty)
```

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
(Intercept)	1.2488999	0.9029389	1.5948609	0.1761888	7.088419	<0.001	***
INFL	0.9749756	0.9106992	1.0392519	0.0327342	29.784580	<0.001	***
PROD	0.0947197	0.0560113	0.1334281	0.0197132	4.804897	<0.001	***

```
reg.lm <- lm("INTRATE ~ INFL + PROD + UNEMPL", data)
pretty <- prettify(summary(reg.lm))
kable(pretty)
```

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
(Intercept)	1.2041389	0.8660647	1.5422131	0.1721717	6.993824	<0.001	***
INFL	0.8912722	0.8223824	0.9601620	0.0350836	25.404215	<0.001	***
PROD	-0.0798905	-0.1502215	-0.0095595	0.0358176	-2.230481	0.026	*
UNEMPL	0.4978332	0.3287130	0.6669535	0.0861282	5.780141	<0.001	***

```
reg.lm <- lm("INTRATE ~ INFL + COMMPRI + UNEMPL", data)
pretty <- prettify(summary(reg.lm))
kable(pretty)
```

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
(Intercept)	1.1594975	0.8287739	1.4902210	0.1684283	6.884221	<0.001	***
INFL	0.9170358	0.8550160	0.9790557	0.0315850	29.033920	<0.001	***

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
COMMPRI	-0.0076010	-0.0129378	-0.0022642	0.0027179	-2.796663	0.005	**
UNEMPL	0.3545387	0.2629196	0.4461578	0.0466591	7.598498	<0.001	***

```r
reg.lm <- lm("INTRATE ~ INFL + PCE + UNEMPL", data)
pretty <- prettify(summary(reg.lm))
kable(pretty)
```

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.2419448	-0.2321112	0.7160008	0.2414235	1.002159	0.317	
INFL	0.7603813	0.6715227	0.8492398	0.0452532	16.802823	<0.001	***
PCE	0.2744626	0.1670964	0.3818288	0.0546786	5.019560	<0.001	***
UNEMPL	0.1376249	0.0192107	0.2560391	0.0603051	2.282146	0.023	*

```r
reg.lm <- lm("INTRATE ~ INFL + PCE + PERSINC", data)
pretty <- prettify(summary(reg.lm))
kable(pretty)
```

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.0212188	-0.4310181	0.4734556	0.2303116	0.0921308	0.927	
INFL	0.8754199	0.7756201	0.9752196	0.0508252	17.2241233	<0.001	***
PCE	0.1811769	0.0769122	0.2854417	0.0530991	3.4120506	0.001	***
PERSINC	0.3054090	0.1884766	0.4223415	0.0595504	5.1285776	<0.001	***

```r
reg.lm <- lm("INTRATE ~ INFL + PCE + PERSINC + HOUST", data)
pretty <- prettify(summary(reg.lm))
kable(pretty)
```

	Estimate	CI (lower)	CI (upper)	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.2135714	-0.6679775	0.2408347	0.2314157	-0.9228905	0.356	
INFL	0.7448085	0.6335857	0.8560314	0.0566425	13.1492793	<0.001	***
PCE	0.3109752	0.1960109	0.4259395	0.0585480	5.3114612	<0.001	***
PERSINC	0.2568855	0.1403078	0.3734631	0.0593696	4.3268857	<0.001	***
HOUST	-0.0215219	-0.0301584	-0.0128855	0.0043983	-4.8932529	<0.001	***

```r
summary(reg.lm)
```

```
##
## Call:
## lm(formula = "INTRATE ~ INFL + PCE + PERSINC + HOUST", data = data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -6.8827 -1.5365 -0.1099  1.3049  7.7022
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.213571   0.231416  -0.923    0.356
```

```
## INFL         0.744809   0.056643  13.149  < 2e-16 ***
## PCE          0.310975   0.058548   5.311 1.49e-07 ***
## PERSINC      0.256885   0.059370   4.327 1.75e-05 ***
## HOUST       -0.021522   0.004398  -4.893 1.25e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.2 on 655 degrees of freedom
## Multiple R-squared:  0.6329, Adjusted R-squared:  0.6306
## F-statistic: 282.3 on 4 and 655 DF,  p-value: < 2.2e-16
```

As the final result we've got the same model as in (a).

(c) Compare your model from (a) and the Taylor rule of equation (1). Consider R^2, AIC and BIC. Which of the models do you prefer?

```r
model1 <- lm("INTRATE ~ INFL + PCE + PERSINC + HOUST", data)
taylor <- lm("INTRATE ~ INFL + PROD", data)
AIC(model1, taylor)
```

	df	AIC
model1	6	2920.519
taylor	4	3013.616

```r
BIC(model1, taylor)
```

	df	BIC
model1	6	2947.473
taylor	4	3031.585

```r
summary(model1)$r.squared
```

```
## [1] 0.6328852
```

```r
summary(taylor)$r.squared
```

```
## [1] 0.5747014
```

I prefer model1, as it explains better the variability in data.

(d) Test the Taylor rule of equation (1) using the RESET test, Chow break and forecast test (with in both tests as break date January 1980) and a Jarque-Bera test. What do you conclude?

```r
resettest(data$INTRATE ~ data$INFL + data$PROD)
```

```
##
```

```
##  RESET test
##
## data:  data$INTRATE ~ data$INFL + data$PROD
## RESET = 2.2578, df1 = 2, df2 = 655, p-value = 0.1054
```

```r
library(gap)
```

```
## gap version 1.2.2
```

```
##
## Attaching package: 'gap'
```

```
## The following object is masked from 'package:car':
##
##     logit
```

```r
data$Year <- substr(data$OBS, start=1,stop=4)
grp <- data[data$Year < 1980, ]
x1 <- grp[, c("INFL", "PROD")]; y1 <- data.frame( INTRATE = grp["INTRATE"])
grp <- data[data$Year >= 1980, ]
x2 <- grp[, c("INFL", "PROD")]; y2 <- data.frame( INTRATE = grp["INTRATE"])
#chow.test
chow.test(y1, x1, y2, x2)
```

```
##      F value        d.f.1        d.f.2      P value
## 2.873501e+01 3.000000e+00 6.540000e+02 1.836802e-17
```