Binary Choice Estimation

Look at using R to calculate some results in Skjeltorp and Ødegaard (2015).

In the paper we investigate decisions by firms to hire a Designated Market Maker, a financial market participant that guarantees a minimum liquidity in the firm's stock, against a fee. This decision is a binary choice, either the firm hires a liquidity provider, or not. We investigate what determines this decision.

Going into the reasoning for the possible determinants is not necessary for our purposes, let us just list the possible determinants.

- ▶ Constant
- ▶ Liquidity (Relative Spread)
- ▶ Q
- ▶ Sales Growth
- ▶ Dummy for whether the firm has a repurchase program
- ▶ Dummy for whether the firm has been listed for less than 2 years.

We estimate a probit model where these are possible explantory
variables.

Let us look at the way this is estimated in R.

First, the data. It has been dumped into a csv file such as:

```
secid,year,HireDMMThisYear,HaveDMMThisYear,TobinsQ,lnOpIncome,FracLargestOwner,SalesGrowth,RepurchaseLate
6001,2005,false,false,1.66207,13.5709,0.31858,0.06701,1,1,0,1,0.03349,0.0762903,0.16996,0,0,0.0891234,-0.16
6006,2005,false,false,1.70654,11.7577,0.1972,-0.05269,1,0,0,0,0.00401,0.0335354,0.375494,0,0,0.133597,-0.56
6026,2005,true,true,1.60246,12.8338,0.40392,0.166596,1,1,0,5,0.02021,0.024252,0.960784,0,0,0.0295194,0.2824
```

Reading the data

```
data <- read.table("../data/data_excluding_already_using_dr
                    sep=",",header=TRUE,row.names=NULL)
```

To work with the data, let us name the various data series

```
hireDMM <- data$HireDMMThisYear=="true"
FracYearTrading <- data$FracTradingDays
RelSpread <- data$RelSpread
Q <- data$TobinsQ
SG <- data$SalesGrowth
AnnRepu <- data$AnnouncedRepurchase
NewListing<-data$ListingPeriod
```

Let us now do the probit regression.
The call to the routine is:

```
reg1 <- glm(hireDMM~RelSpread + Q+AnnRepu+NewListing,
            subset=(FracYearTrading<0.90),
            family=binomial(link="probit"))
```

The results

```
glm(formula = hireDMM ~ RelSpread + Q + AnnRepu + NewListin
    family = binomial(link = "probit"), subset = (FracYear
        0.9))

Deviance Residuals:
    Min      1Q   Median      3Q      Max
-1.1069  -0.4619  -0.3923  -0.3528   2.4778

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -1.44319    0.20188  -7.149 8.76e-13 ***
RelSpread   -2.55584    2.71963  -0.940  0.34733
Q            0.20851    0.06060   3.441  0.00058 ***
AnnRepu      0.05871    0.20846   0.282  0.77824
NewListing   0.19375    0.17551   1.104  0.26963
```

More presentable table

	Dependent variable:			
	Hire DMM			
	(1)	(2)	(3)	(4)
Liquidity (Rel.Spread)	-2.56	-11.78^{***}		
	(2.72)	(4.12)		
Q	0.21^{***}		0.21^{***}	0.22^{***}
	(0.06)		(0.06)	(0.06)
Sales Growth		0.03		
		(0.14)		
Repurchase Program	0.06	0.09	0.07	0.06
	(0.21)	(0.25)	(0.21)	(0.21)
Listed $<$ 2 years	0.19	0.09	0.25	
	(0.18)	(0.25)	(0.17)	
Constant	-1.44^{***}	-0.75^{***}	-1.62^{***}	-1.56^{***}
	(0.20)	(0.26)	(0.12)	(0.11)

```
R code:

reg1 <- glm(hireDMM~RelSpread + Q+AnnRepu+NewListing,
            subset=(FracYearTrading<0.90), family=binomial(link=
reg2 <- glm(hireDMM~RelSpread+SG+AnnRepu+NewListing,
            subset=(FracYearTrading<0.90),
            family=binomial(link="probit"))
reg3 <- glm(hireDMM~ Q+AnnRepu+NewListing,
            subset=(FracYearTrading<0.90),
            family=binomial(link="probit"))
reg4 <- glm(hireDMM~Q+AnnRepu,
            subset=(FracYearTrading<0.90),
            family=binomial(link="probit"))
depvarlbls <- c("Hire DMM","Hire DMM","Hire DMM","Hire DMM")
labls <- c("Liquidity (Rel.Spread)","Q","Sales Growth",
           "Repurchase Program","Listed $<$ 2 years")
tabl1 <- stargazer(reg1,reg2,reg3,reg4,digits=2,
                   title="Ex ante, Dependent variable hire DMM",
                   covariate.labels = labls,
                   float=FALSE,
                   dep.var.labels=depvarlbls)
cat(tabl1,file="../R_tables/hire_dmm_ex_ante_variables_90.tex",s
```

Johannes Skjeltorp and Bernt Arne Ødegaard. Why do listed firms pay for market making in their own stock? *Financial Management*, pages 241–261, Summer 2015.