Defense Services Equations

# Presentation of Estimatinating Euation

As described in section 4.3, this paper includes five different equations: likelihood some options are exercised; likelihood all options are exercised; likelihood of a ceiling breach; size of ceiling breach given a breach occurring; and likelihood of termination. The variable indicators used in the equations are listed in Appendix B. Each predictor in the equations has a subscript i, which refers to the individual contract or task order. The level 2, 3, and 4 variables, covered in Table B 3, are listed at the start of each equation with an α coefficient that varies has a different intercept for each value of with the underlying variable (that is, subscripts j, k, l, m, n, o, and p) and whose calculation is described in the corresponding formula at the end of equation. Subscript j refers to the NAICS subsector, subscript k refers to the NAICS detailed industry, subscript l refers to the service area, subscript m refers to the contracting agency, subscript n refers to the contracting office, subscript o refers to the place of performance, and subscript p refers to the calendar year (for those equations that include it).

The remaining variables have β coefficients, with each non-base level of the categorical variables receiving a separate coefficient.

# Options

Note that because we use the complete dataset for exercised options, there’s no 1 million entry variant.

##   
## =========================================================================  
## Some Opt All Opt   
## -------------------------------------------------------------------------  
## (Intercept) 0.61 \*\* 1.27 \*\*\*  
## (0.19) (0.13)   
## cln\_US6sal 0.03 0.06   
## (0.06) (0.05)   
## cln\_PSCrate -0.07 \* -0.05   
## (0.03) (0.03)   
## cp\_OffPerf7 -0.02 0.04   
## (0.04) (0.04)   
## cp\_OffPSC7 0.00 0.17 \*\*\*  
## (0.05) (0.05)   
## cn\_PairHist7 0.32 \*\*\* 0.13 \*\*\*  
## (0.02) (0.02)   
## cln\_PairCA -0.01 -0.13 \*\*   
## (0.04) (0.04)   
## cln\_Base 0.02 -0.19 \*\*\*  
## (0.03) (0.03)   
## clr\_Ceil2Base 0.25 \*\*\* -0.79 \*\*\*  
## (0.01) (0.02)   
## cln\_Days 0.42 \*\*\* -0.38 \*\*\*  
## (0.03) (0.04)   
## Comp1 Offer 0.07 \* -0.00   
## (0.03) (0.03)   
## Comp2-4 Offers 0.11 \*\*\* -0.02   
## (0.03) (0.03)   
## Comp5+ Offers -0.17 \*\*\* -0.09 \*\*   
## (0.03) (0.03)   
## VehS-IDC -0.70 \*\*\* -0.17 \*\*\*  
## (0.04) (0.04)   
## VehM-IDC -0.30 \*\*\* -0.15 \*\*\*  
## (0.04) (0.04)   
## VehFSS/GWAC -0.18 \*\*\* -0.07   
## (0.04) (0.04)   
## VehBPA/BOA -0.52 \*\*\* 0.27 \*\*   
## (0.07) (0.08)   
## PricingUCAOther FP -0.56 \*\*\* -0.57 \*\*   
## (0.15) (0.20)   
## PricingUCAIncentive -0.33 0.32   
## (0.27) (0.25)   
## PricingUCACombination or Other 0.32 \*\*\* -0.10   
## (0.08) (0.07)   
## PricingUCAOther CB 0.14 \* 0.17 \*\*   
## (0.06) (0.06)   
## PricingUCAT&M/LH/FPLOE 0.00 -0.04   
## (0.06) (0.06)   
## PricingUCAUCA -0.07 -0.11   
## (0.11) (0.14)   
## CrisisARRA -0.36 \* -0.24   
## (0.16) (0.21)   
## CrisisDis -0.32 -1.58 \*\*\*  
## (0.30) (0.43)   
## CrisisOCO -0.99 \*\*\* -0.43 \*\*\*  
## (0.10) (0.11)   
## cln\_Def6HHI -0.19 \*\*\* -0.10 \*   
## (0.04) (0.04)   
## clr\_Def6toUS -0.06 0.17 \*\*   
## (0.06) (0.06)   
## cln\_Def3HHI -0.15 \*\* 0.02   
## (0.06) (0.05)   
## clr\_Def3toUS -0.04 0.05   
## (0.07) (0.06)   
## cp\_PairObl7 -0.12 \* -0.09   
## (0.05) (0.05)   
## cln\_OffObl7 0.14 \*\* -0.11 \*\*\*  
## (0.05) (0.03)   
## cln\_OffFocus -0.48 \*\*\* -0.08   
## (0.05) (0.05)   
## cp\_OffPerf7:cp\_PairObl7 0.29 \*\*\* 0.12   
## (0.07) (0.08)   
## cn\_PairHist7:PricingUCAOther FP 0.01   
## (0.34)   
## cn\_PairHist7:PricingUCAIncentive 1.12 \*   
## (0.47)   
## cn\_PairHist7:PricingUCACombination or Other -0.57 \*\*\*   
## (0.17)   
## cn\_PairHist7:PricingUCAOther CB 0.11   
## (0.08)   
## cn\_PairHist7:PricingUCAT&M/LH/FPLOE -0.07   
## (0.11)   
## cn\_PairHist7:PricingUCAUCA -0.05   
## (0.22)   
## cln\_Base:clr\_Ceil2Base 0.50 \*\*\*   
## (0.02)   
## cp\_OffPSC7:cln\_OffObl7 1.08 \*\*\*   
## (0.14)   
## cp\_OffPSC7:cln\_OffFocus 0.24 \*   
## (0.10)   
## cln\_PSCrate:PricingUCAOther FP -0.10   
## (0.55)   
## cln\_PSCrate:PricingUCAIncentive -0.27   
## (0.54)   
## cln\_PSCrate:PricingUCACombination or Other 0.29   
## (0.18)   
## cln\_PSCrate:PricingUCAOther CB 0.40 \*\*   
## (0.13)   
## cln\_PSCrate:PricingUCAT&M/LH/FPLOE 0.07   
## (0.18)   
## cln\_PSCrate:PricingUCAUCA 0.89 \*\*   
## (0.33)   
## -------------------------------------------------------------------------  
## AIC 88975.17 73416.80   
## BIC 89434.70 73850.61   
## Log Likelihood -44438.59 -36660.40   
## Num. obs. 87387 62180   
## Num. groups: ServArea:(NAICS6:NAICS3) 1577 1406   
## Num. groups: Office:Agency 773 694   
## Num. groups: NAICS6:NAICS3 635 589   
## Num. groups: Place 124 109   
## Num. groups: NAICS3 78 74   
## Num. groups: Agency 24 24   
## Num. groups: StartFY 9 9   
## Var: ServArea:(NAICS6:NAICS3) (Intercept) 0.12 0.06   
## Var: Office:Agency (Intercept) 0.55 0.22   
## Var: NAICS6:NAICS3 (Intercept) 0.04 0.12   
## Var: Place (Intercept) 0.14 0.06   
## Var: NAICS3 (Intercept) 0.05 0.00   
## Var: Agency (Intercept) 0.06 0.07   
## Var: StartFY (Intercept) 0.05 0.02   
## =========================================================================  
## \*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05

## Some Options Likelihood

## All Options Likelihood

# Ceiling Breach

##   
## ============================================================================  
## Breach Likelihood BreachSize   
## ----------------------------------------------------------------------------  
## (Intercept) -4.32 \*\*\* 8.80 \*\*\*  
## (0.18) (0.12)   
## cln\_US6sal -0.07 -0.05   
## (0.06) (0.06)   
## cln\_PSCrate 0.05 \*\*\* 0.08 \*\*\*  
## (0.01) (0.02)   
## cp\_OffPerf7 0.12 \*\*\* -0.03   
## (0.03) (0.03)   
## cp\_OffPSC7 0.17 \*\*\* 0.12 \*\*\*  
## (0.02) (0.03)   
## cn\_PairHist7 -0.09 \*\*\* 0.03   
## (0.01) (0.02)   
## cln\_PairCA 0.45 \*\*\* -0.07 \*   
## (0.02) (0.03)   
## cln\_Base 1.37 \*\*\* 2.66 \*\*\*  
## (0.01) (0.02)   
## clr\_Ceil2Base 0.30 \*\*\* 0.29 \*\*\*  
## (0.01) (0.02)   
## cln\_Days 0.30 \*\*\* 0.06 \*\*   
## (0.01) (0.02)   
## Comp1 Offer 0.00 -0.01   
## (0.02) (0.03)   
## Comp2-4 Offers 0.13 \*\*\* -0.09 \*\*\*  
## (0.01) (0.02)   
## Comp5+ Offers 0.19 \*\*\* -0.05 \*   
## (0.01) (0.02)   
## VehS-IDC -0.48 \*\*\* 0.03   
## (0.02) (0.02)   
## VehM-IDC -0.14 \*\*\* -0.00   
## (0.02) (0.03)   
## VehFSS/GWAC -0.00 0.11 \*   
## (0.03) (0.05)   
## VehBPA/BOA -0.39 \*\*\* -0.15 \*\*   
## (0.03) (0.05)   
## PricingUCAOther FP -0.59 \*\*\* -1.02 \*\*\*  
## (0.06) (0.10)   
## PricingUCAIncentive 2.37 \*\*\* 0.79 \*\*\*  
## (0.07) (0.11)   
## PricingUCACombination or Other 0.29 \*\*\* 0.47 \*\*\*  
## (0.05) (0.07)   
## PricingUCAOther CB -0.05 0.88 \*\*\*  
## (0.03) (0.05)   
## PricingUCAT&M/LH/FPLOE 0.13 \*\* 0.65 \*\*\*  
## (0.04) (0.07)   
## PricingUCAUCA 0.04 0.33 \*\*\*  
## (0.04) (0.06)   
## CrisisARRA 0.08 -0.06   
## (0.04) (0.06)   
## CrisisDis 0.07 0.40 \*\*   
## (0.09) (0.13)   
## CrisisOCO -0.07 0.07   
## (0.05) (0.07)   
## cln\_Def6HHI -0.11 \*\*\* 0.01   
## (0.03) (0.04)   
## clr\_Def6toUS 0.05 0.15 \*\*   
## (0.05) (0.06)   
## cln\_Def3HHI -0.04 0.14 \*\*   
## (0.03) (0.05)   
## clr\_Def3toUS 0.03 0.11   
## (0.07) (0.08)   
## cp\_PairObl7 -0.22 \*\*\* 0.08 \*   
## (0.02) (0.03)   
## cln\_OffObl7 0.00 0.02   
## (0.02) (0.02)   
## cln\_OffFocus -0.34 \*\*\* 0.01   
## (0.04) (0.05)   
## cp\_OffPerf7:cln\_PairCA 0.46 \*\*\* -0.18 \*\*\*  
## (0.02) (0.04)   
## cp\_OffPerf7:cln\_Days -0.10 \*\*\* -0.17 \*\*\*  
## (0.02) (0.03)   
## ----------------------------------------------------------------------------  
## AIC 362045.48 277317.31   
## BIC 362541.73 277710.89   
## Log Likelihood -180980.74 -138615.66   
## Num. obs. 1000000 69776   
## Num. groups: ServArea:(NAICS6:NAICS3) 3217 1326   
## Num. groups: Office:Agency 1092 670   
## Num. groups: NAICS6:NAICS3 879 568   
## Num. groups: Place 191 132   
## Num. groups: NAICS3 82 76   
## Num. groups: Agency 24 23   
## Num. groups: StartFY 9 9   
## Var: ServArea:(NAICS6:NAICS3) (Intercept) 0.25 0.13   
## Var: Office:Agency (Intercept) 1.47 0.15   
## Var: NAICS6:NAICS3 (Intercept) 0.12 0.05   
## Var: Place (Intercept) 0.27 0.10   
## Var: NAICS3 (Intercept) 0.16 0.07   
## Var: Agency (Intercept) 0.17 0.06   
## Var: StartFY (Intercept) 0.02 0.00   
## Var: Residual 3.04   
## ============================================================================  
## \*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05

## Breach Likelihood

## Breach Size

#Terminations

##   
## ===================================================================  
## Termination Likelihood  
## -------------------------------------------------------------------  
## (Intercept) -4.56 \*\*\*   
## (0.15)   
## cln\_US6sal -0.03   
## (0.06)   
## cln\_PSCrate -0.01   
## (0.02)   
## cp\_OffPerf7 0.09 \*   
## (0.04)   
## cp\_OffPSC7 0.41 \*\*\*   
## (0.04)   
## cn\_PairHist7 -0.26 \*\*\*   
## (0.02)   
## cln\_PairCA -0.07 \*   
## (0.03)   
## cln\_Base 0.27 \*\*\*   
## (0.02)   
## cln\_Days 0.87 \*\*\*   
## (0.03)   
## clr\_Ceil2Base 0.49 \*\*\*   
## (0.01)   
## Comp1 Offer 0.36 \*\*\*   
## (0.03)   
## Comp2-4 Offers 0.35 \*\*\*   
## (0.03)   
## Comp5+ Offers 0.72 \*\*\*   
## (0.03)   
## VehS-IDC -0.66 \*\*\*   
## (0.03)   
## VehM-IDC -0.39 \*\*\*   
## (0.03)   
## VehFSS/GWAC -0.17 \*\*\*   
## (0.05)   
## VehBPA/BOA -0.92 \*\*\*   
## (0.06)   
## PricingUCAOther FP -1.52 \*\*\*   
## (0.09)   
## PricingUCAIncentive -1.25 \*\*   
## (0.45)   
## PricingUCACombination or Other -0.11   
## (0.11)   
## PricingUCAOther CB -0.42 \*\*\*   
## (0.08)   
## PricingUCAT&M/LH/FPLOE -0.44 \*\*\*   
## (0.09)   
## PricingUCAUCA -0.80 \*\*\*   
## (0.15)   
## CrisisARRA -0.21   
## (0.13)   
## CrisisDis 0.49 \*   
## (0.20)   
## CrisisOCO 0.02   
## (0.07)   
## cln\_Def6HHI 0.00   
## (0.04)   
## clr\_Def6toUS 0.11   
## (0.06)   
## cln\_Def3HHI -0.01   
## (0.05)   
## clr\_Def3toUS -0.01   
## (0.07)   
## cp\_PairObl7 -0.13 \*\*\*   
## (0.04)   
## cln\_OffObl7 0.01   
## (0.03)   
## cln\_OffFocus -0.31 \*\*\*   
## (0.05)   
## cn\_PairHist7:PricingUCAOther FP -1.42 \*\*\*   
## (0.15)   
## cn\_PairHist7:PricingUCAIncentive 0.30   
## (0.94)   
## cn\_PairHist7:PricingUCACombination or Other 0.24   
## (0.23)   
## cn\_PairHist7:PricingUCAOther CB 0.41 \*\*   
## (0.14)   
## cn\_PairHist7:PricingUCAT&M/LH/FPLOE -0.62 \*\*\*   
## (0.18)   
## cn\_PairHist7:PricingUCAUCA -0.53   
## (0.28)   
## -------------------------------------------------------------------  
## AIC 137657.97   
## BIC 138201.49   
## Log Likelihood -68782.99   
## Num. obs. 1000000   
## Num. groups: ServArea:(NAICS6:NAICS3) 3217   
## Num. groups: Office:Agency 1092   
## Num. groups: NAICS6:NAICS3 879   
## Num. groups: Place 191   
## Num. groups: NAICS3 82   
## Num. groups: Agency 24   
## Num. groups: StartFY 9   
## Var: ServArea:(NAICS6:NAICS3) (Intercept) 0.19   
## Var: Office:Agency (Intercept) 0.74   
## Var: NAICS6:NAICS3 (Intercept) 0.13   
## Var: Place (Intercept) 0.38   
## Var: NAICS3 (Intercept) 0.04   
## Var: Agency (Intercept) 0.07   
## Var: StartFY (Intercept) 0.00   
## ===================================================================  
## \*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05