USA | Add Equation Parameter Matrix | Write USA Equations | Put USA Equations in Model | Calculate 1 Intercept | Edit Equation | Equation Bank | Symmetry

USA - Equation Parameter Matrices and Equations

export price (world prices with or without ftm trade premium and with export tax)

export price	non-fta or fta mem.	fta premium	export tax	world p. trans. e.	exchange rate
px	*((1-!ftm)	(1+FTAtf|))	*(1-!tx|)	WLDpx|^#)	/!xrt
FOODA	-	-	-	1.0	-
BEVTB	-	-	-	1.0	-
CRUDM	-	-	-	1.0	-
FUELS	-	-	-	1.0	-
OILFT	-	-	-	1.0	-
CHEMR	-	-	-	1.0	-
MANUG	-	-	-	1.0	-
MACHT	-	-	-	1.0	-
MISCM	-	-	-	1.0	-
CTNEC	-	-	-	1.0	-

The export price depends upon the world price, the exchange rate, and tariff/tax interventions of various kinds. They may be an export tax or a free trade agreement "in market" premium. Equations are designed to respond to many policy variables.

import price (with own, ftm, or cmm tariff and non-competitive tax)

import price	non-comp. tax	existing tariff	fta tariff	cmk tariff	world p. trans. e.	exchange rate
pm	*!xx|	n)*(1+!tm|)	TAtf|,!tm|))	L+CMKtc|))	WLDpx|^#)	/!xrt
FOODA	-	-	-	-	1.0	-
BEVTB	-	-	-	-	1.0	-
CRUDM	-	-	-	-	1.0	-
FUELS	-	-	-	-	1.0	-
OILFT	-	-	-	-	1.0	-
CHEMR	-	-	-	-	1.0	-
MANUG	-	-	-	-	1.0	-
MACHT	-	-	-	-	1.0	-
MISCM	-	-	-	-	1.0	-
CTNEC	-	-	-	-	1.0	-

Imports too depend upon world prices and exchange rates. Depending upon policies imposed, they may reflect the applied import tariff, a common market tariff, a free trade area self sufficiency tariff, or a non-competitiveness tax (a premium importers extract by restricting imports beyond the limit implied by the import tariff).

exports

export supply	supply shift term	supply elast.
xs	*!fx|	*!px|^#
FOODA	-	1.00
BEVTB	-	1.00
CRUDM	-	1.00
FUELS	-	1.00
OILFT	-	1.00
CHEMR	-	1.00
MANUG	-	1.00
MACHT	-	1.00
MISCM	-	1.00
CTNEC	-	1.00

This is a constant elasticity suppy equation generator. The shift term can change if the productivity equation is engaged.

USA | Add Equation Parameter Matrix | Write USA Equations | Put USA Equations in Model | Calculate 1 Intercept

imports

import demand	demand shift term	demand elast.
md	*!fm|	*!pm|^#
FOODA	-	-1.00
BEVTB	-	-1.00
CRUDM	-	-1.00
FUELS	-	-1.00
OILFT	-	-1.00
CHEMR	-	-1.00
MANUG	-	-1.00
MACHT	-	-1.00
MISCM	-	-1.00
CTNEC	-	-1.00

This is a constant elasticity import demand equation.

net trade = xs - md

net trade	export supply	import demand
nt	+!xs|	-!md|
FOODA	-	-
BEVTB	-	-
CRUDM	-	-
FUELS	-	-
OILFT	-	-
CHEMR	-	-
MANUG	-	-
MACHT	-	-
MISCM	-	-
CTNEC	-	-

Exports - imports = Net trade

balance of payments

balance payments	net trade at wld p.	capital flow
bop	ntCTNEC))	+!cfl)
bop	-	-

The balance of payments is the sum of net trade using world prices and must equal capital flows in the equilibrium state

FTA tariff or 9

FTA tariff	FTA tariff or 9
zz	+(1-!ftm)*9
FOODA	-
BEVTB	-
CRUDM	-
FUELS	-
OILFT	-
CHEMR	-
MANUG	-
MACHT	-
MISCM	-

zz is a variable used to find the minimum tariff for a product among free trade agreement members. This becomes a component in the free trade agreement premium used in the export and import price equations.

USA	Add Equation Parameter Matrix	Write USA Equations	Put USA Equations in Model	Calculate 1 Intercept
CTNEC	-			

1+tariff equivalent of non-competitive import demand

nc tariff equiv.	demand elast.	tariff reduct.
xx	b|/ABS(#)))	0001+!bt|))
FOODA	-1.00	-
BEVTB	-1.00	-
CRUDM	-1.00	-
FUELS	-1.00	-
OILFT	-1.00	-
CHEMR	-1.00	-
MANUG	-1.00	-
MACHT	-1.00	-
MISCM	-1.00	-
CTNEC	-1.00	-

If an importer has monopoly power, they can restrict imports to the point where the marginal revenue per unit equals the import price. The import customer then pays the world price + the import duty + the premium calculated by xx. The calculation uses the import demand elasticity and xx is also assumed to be related to the tariff rate (a zero tariff comes with no restriction but a higher one does). As a tariff is reduced, it is assumed that the restrictive power of the importer decreases. This the specification insures that liberalization also increases competition in a restricted market.

supply equation shift term - when switched ON, it responds to export price changes, emulating productivity responses to price changes

supply sheft	shift share	supply elast.	% price change	ON (1), OFF sw.
fx	+#	*#	*(!px|-1)	*#
FOODA	0.7	1.00	-	0.000001
BEVTB	0.7	1.00	-	0.000001
CRUDM	0.7	1.00	-	0.000001
FUELS	0.7	1.00	-	0.000001
OILFT	0.7	1.00	-	0.000001
CHEMR	0.7	1.00	-	0.000001
MANUG	0.7	1.00	-	0.000001
MACHT	0.7	1.00	-	0.000001
MISCM	0.7	1.00	-	0.000001
CTNEC	0.7	1.00	-	0.000001

This is the productivity equation. It assumes that as export prices rise, productivity increases. The parameters set the amount of response. The ON/OFF switch allows you to turn the equation on or off. With all of these equations, the calculation of the constant term changes if you change the parameters. Hence if you do change equation parameters, the equations must be re-written.

base trade (sum of base exports and base imports)

base trade	sum bx, bm
yy	+!bx|+!bm|
FOODA	-
BEVTB	-
CRUDM	-
FUELS	-
OILFT	-
CHEMR	-
MANUG	-
MACHT	-
MISCM	-
CTNEC	-

This is just a calculation of total trade (exports + imports) which is used in some indicator variables.

Equations

USA | Add Equation Parameter Matrix | Write USA Equations | Put USA Equations in Model | Calculate 1 Intercept

USApxFOO 1*((1-USAftm)+USAftm*(1+FTAtfFOODA))*(1-USAtxFOODA)*(WLDpxFOODA^1)/USAxrt
USApxBEV 1*((1-USAftm)+USAftm*(1+FTAtfBEVTB))*(1-USAtxBEVTB)*(WLDpxBEVTB^1)/USAxrt
USApxCRU 1*((1-USAftm)+USAftm*(1+FTAtfCRUDM))*(1-USAtxCRUDM)*(WLDpxCRUDM^1)/USAxrt
USApxFUE 1*((1-USAftm)+USAftm*(1+FTAtfFUELS))*(1-USAtxFUELS)*(WLDpxFUELS^1)/USAxrt
USApxOIL 1*((1-USAftm)+USAftm*(1+FTAtfOILFT))*(1-USAtxOILFT)*(WLDpxOILFT^1)/USAxrt
USApxCHE 1*((1-USAftm)+USAftm*(1+FTAtfCHEMR))*(1-USAtxCHEMR)*(WLDpxCHEMR^1)/USAxrt
USApxMAI 1*((1-USAftm)+USAftm*(1+FTAtfMANUG))*(1-USAtxMANUG)*(WLDpxMANUG^1)/USAxrt
USApxMAC 1*((1-USAftm)+USAftm*(1+FTAtfMACHT))*(1-USAtxMACHT)*(WLDpxMACHT^1)/USAxrt
USApxMIS 1*((1-USAftm)+USAftm*(1+FTAtfMISCM))*(1-USAtxMISCM)*(WLDpxMISCM^1)/USAxrt
USApxCTN 1*((1-USAftm)+USAftm*(1+FTAtfCTNEC))*(1-USAtxCTNEC)*(WLDpxCTNEC^1)/USAxrt
USApmFOO 1*USAxxFOODA*((1-USAftm-USAcmm)*(1+USAtmFOODA)+USAftm*(1+MIN(FTAtfFOODA,USAtmFOODA))+USAcmm*(1+CMKtcFOODA))*(WLDpxFOODA^1)/USAxrt
USApmBEV 1*USAxxBEVTB*((1-USAftm-USAcmm)*(1+USAtmBEVTB)+USAftm*(1+MIN(FTAtfBEVTB,USAtmBEVTB))+USAcmm*(1+CMKtcBEVTB))*(WLDpxBEVTB^1)/USAxrt
USApmCRU 1*USAxxCRUDM*((1-USAftm-USAcmm)*(1+USAtmCRUDM)+USAftm*(1+MIN(FTAtfCRUDM,USAtmCRUDM))+USAcmm*(1+CMKtcCRUDM))*(WLDpxCRUDM^1)/USAxrt
USApmFUE 1*USAxxFUELS*((1-USAftm-USAcmm)*(1+USAtmFUELS)+USAftm*(1+MIN(FTAtfFUELS,USAtmFUELS))+USAcmm*(1+CMKtcFUELS))*(WLDpxFUELS^1)/USAxrt
USApmOIL 1*USAxxOILFT*((1-USAftm-USAcmm)*(1+USAtmOILFT)+USAftm*(1+MIN(FTAtfOILFT,USAtmOILFT))+USAcmm*(1+CMKtcOILFT))*(WLDpxOILFT^1)/USAxrt
USApmCHE 1*USAxxCHEMR*((1-USAftm-USAcmm)*(1+USAtmCHEMR)+USAftm*(1+MIN(FTAtfCHEMR,USAtmCHEMR))+USAcmm*(1+CMKtcCHEMR))*(WLDpxCHEMR^1)/USAxrt
USApmMAI 1*USAxxMANUG*((1-USAftm-USAcmm)*(1+USAtmMANUG)+USAftm*(1+MIN(FTAtfMANUG,USAtmMANUG))+USAcmm*(1+CMKtcMANUG))*(WLDpxMANUG^1)/USAxrt
USApmMAC 1*USAxxMACHT*((1-USAftm-USAcmm)*(1+USAtmMACHT)+USAftm*(1+MIN(FTAtfMACHT,USAtmMACHT))+USAcmm*(1+CMKtcMACHT))*(WLDpxMACHT^1)/USAxrt
USApmMIS 1*USAxxMISCM*((1-USAftm-USAcmm)*(1+USAtmMISCM)+USAftm*(1+MIN(FTAtfMISCM,USAtmMISCM))+USAcmm*(1+CMKtcMISCM))*(WLDpxMISCM^1)/USAxrt
USApmCTN 1*USAxxCTNEC*((1-USAftm-USAcmm)*(1+USAtmCTNEC)+USAftm*(1+MIN(FTAtfCTNEC,USAtmCTNEC))+USAcmm*(1+CMKtcCTNEC))*(WLDpxCTNEC^1)/USAxrt
USAxsFOO 52600273.2*USAfxFOODA*USApxFOODA^1
USAxsBEV 7269448.3*USAfxBEVTB*USApxBEVTB^1
USAxsCRU 43795703.1*USAfxCRUDM*USApxCRUDM^1
USAxsFUE 30582678.5*USAfxFUELS*USApxFUELS^1
USAxsOIL 2003899.6*USAfxOILFT*USApxOILFT^1
USAxsCHE 140499681.6*USAfxCHEMR*USApxCHEMR^1
USAxsMAI 94568687.6*USAfxMANUG*USApxMANUG^1
USAxsMAC 449647865.7*USAfxMACHT*USApxMACHT^1
USAxsMIS 107992550.4*USAfxMISCM*USApxMISCM^1
USAxsCTN 35616036.4*USAfxCTNEC*USApxCTNEC^1
USAmdFOO 53144877.499852*USAfmFOODA*USApmFOODA^-1
USAmdBEV 18279460.766221*USAfmBEVTB*USApmBEVTB^-1
USAmdCRU 28925082.867375*USAfmCRUDM*USApmCRUDM^-1
USAmdFUE 290632743.068052*USAfmFUELS*USApmFUELS^-1
USAmdOIL 2445383.872216*USAfmOILFT*USApmOILFT^-1
USAmdCHE 131421636.210575*USAfmCHEMR*USApmCHEMR^-1
USAmdMAI 196542339.346334*USAfmMANUG*USApmMANUG^-1
USAmdMAC 655608383.807952*USAfmMACHT*USApmMACHT^-1
USAmdMIS 274022024.802*USAfmMISCM*USApmMISCM^-1
USAmdCTN 59535724.50508*USAfmCTNEC*USApmCTNEC^-1
USAntFOO 0+USAxsFOODA-USAmdFOODA
USAntBEV 0+USAxsBEVTB-USAmdBEVTB
USAntCRU 0+USAxsCRUDM-USAmdCRUDM
USAntFUE 0+USAxsFUELS-USAmdFUELS
USAntOILF 0+USAxsOILFT-USAmdOILFT
USAntCHE 0+USAxsCHEMR-USAmdCHEMR
USAntMAN 0+USAxsMANUG-USAmdMANUG
USAntMAC 0+USAxsMACHT-USAmdMACHT
USAntMIS 0+USAxsMISCM-USAmdMISCM

These are the "readable" versions of equations generated by the above equation parameter matrices. In the model, the variable names are replaced by cell locations for efficiency purposes.

USA | Add Equation Parameter Matrix | Write USA Equations | Put USA Equations in Model | Calculate 1 Intercept

USAntCTN	0+USAxsCTNEC-USAmdCTNEC
USAbop	0+(SUMPRODUCT((WLDpxFOODA:WLDpxCTNEC),(USAntFOODA:USAntCTNEC))+USAcfl)
USAzzFOC	0+USAftm*USAtmFOODA+(1-USAftm)*9
USAzzBEV	0+USAftm*USAtmBEVTB+(1-USAftm)*9
USAzzCRU	0+USAftm*USAtmCRUDM+(1-USAftm)*9
USAzzFUE	0+USAftm*USAtmFUELS+(1-USAftm)*9
USAzzOILI	0+USAftm*USAtmOILFT+(1-USAftm)*9
USAzzCHE	0+USAftm*USAtmCHEMR+(1-USAftm)*9
USAzzMAN	0+USAftm*USAtmMANUG+(1-USAftm)*9
USAzzMAC	0+USAftm*USAtmMACHT+(1-USAftm)*9
USAzzMIS	0+USAftm*USAtmMISCM+(1-USAftm)*9
USAzzCTN	0+USAftm*USAtmCTNEC+(1-USAftm)*9
USAxxFOC	1+((USAcpFOODA/ABS(-1)))*(USAtmFOODA/(0.000001+USAbtFOODA))
USAxxBEV	1+((USAcpBEVTB/ABS(-1)))*(USAtmBEVTB/(0.000001+USAbtBEVTB))
USAxxCRU	1+((USAcpCRUDM/ABS(-1)))*(USAtmCRUDM/(0.000001+USAbtCRUDM))
USAxxFUE	1+((USAcpFUELS/ABS(-1)))*(USAtmFUELS/(0.000001+USAbtFUELS))
USAxxOILI	1+((USAcpOILFT/ABS(-1)))*(USAtmOILFT/(0.000001+USAbtOILFT))
USAxxCHE	1+((USAcpCHEMR/ABS(-1)))*(USAtmCHEMR/(0.000001+USAbtCHEMR))
USAxxMAN	1+((USAcpMANUG/ABS(-1)))*(USAtmMANUG/(0.000001+USAbtMANUG))
USAxxMAC	1+((USAcpMACHT/ABS(-1)))*(USAtmMACHT/(0.000001+USAbtMACHT))
USAxxMIS	1+((USAcpMISCM/ABS(-1)))*(USAtmMISCM/(0.000001+USAbtMISCM))
USAxxCTN	1+((USAcpCTNEC/ABS(-1)))*(USAtmCTNEC/(0.000001+USAbtCTNEC))
USAfxFOC	1+.7*1*(USApxFOODA-1)*.000001
USAfxBEV	1+.7*1*(USApxBEVTB-1)*.000001
USAfxCRU	1+.7*1*(USApxCRUDM-1)*.000001
USAfxFUE	1+.7*1*(USApxFUELS-1)*.000001
USAfxOILF	1+.7*1*(USApxOILFT-1)*.000001
USAfxCHE	1+.7*1*(USApxCHEMR-1)*.000001
USAfxMAN	1+.7*1*(USApxMANUG-1)*.000001
USAfxMAC	1+.7*1*(USApxMACHT-1)*.000001
USAfxMIS	1+.7*1*(USApxMISCM-1)*.000001
USAfxCTN	1+.7*1*(USApxCTNEC-1)*.000001
USAyyFOC	0+USAbxFOODA+USAbmFOODA
USAyyBEV	0+USAbxBEVTB+USAbmBEVTB
USAyyCRU	0+USAbxCRUDM+USAbmCRUDM
USAyyFUE	0+USAbxFUELS+USAbmFUELS
USAyyOILI	0+USAbxOILFT+USAbmOILFT
USAyyCHE	0+USAbxCHEMR+USAbmCHEMR
USAyyMAN	0+USAbxMANUG+USAbmMANUG
USAyyMAC	0+USAbxMACHT+USAbmMACHT
USAyyMIS	0+USAbxMISCM+USAbmMISCM
USAyyCTN	0+USAbxCTNEC+USAbmCTNEC

Note that the data for variables in the data book determines the constants calculated (first term in the equations). The data should be the base period equilibrium values for all variables. Remember that every time you change a data value, data has to be brought into the Basedata sheet of the equation workbook and equations must be re-written.