

Note on Calibration

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1 Calibration

For the original setting, I have the following parameters:

Parameter	Value	Description
Preferences and endowment		
σ	2.0	CRRA
β	0.9775	Sovereign discounting
ρ_y	0.95	Endowment autocorrelation
σ_y	0.005	Endowment innovation
International lending		
r	0.01	Risk-free rate
δ	0.04	5 years debt duration
κ	$r + \delta$	Normalization, $q^{rf} = 1$
Default		
λ_0	-0.48	Penalty linear term
λ_1	0.525	Penalty quadratic term
χ	0.125	2 years average market exclusion
Taste shocks		
η	$5e^{-4}$	Default choice
ρ	$1e^{-5}$	Borrowing choice

Table 1: Parameter Values

so this is quarterly calibrated and the annualized result is shown in Table 2. The main problem is that the mean debt to GDP is too low and the spread is too high given this.

The strategy Following CE 2012, I want to calibrate the default parameters to match the mean (8.15%) and SD of the spread (4.43%) and the debt to GDP ratio (17.5%). I'll first try to match the B/Y ratio. The first trial is shown in Table 3. One particular finding is that by lowering β , resetting the income process parameters as in CE 2012, the result changes hugely. Also, making ρ a

Moment		Value (%)
Mean	Debt to GDP	7.87
	Spread	8.53
Standard Deviation	Spread	3.90
	GDP	3.13
	Consumption	3.56
Correlation with GDP	Spread	-41.13
	Trade Balance to GDP	-29.03

Table 2: Moments (%)

bit larger make the model easier to converge and do not change the result much. The results from this new parameterization are shown in Table 4.

Parameter	Value	Description
Preferences and endowment		
σ	2.0	CRRA
β	0.95	Sovereign discounting
ρ_y	0.948503	Endowment autocorrelation
σ_y	0.027092	Endowment innovation
International lending		
r	0.01	Risk-free rate
δ	0.05	5 years debt duration
κ	$r + \delta$	Normalization, $q^{rf} = 1$
Default		
λ_0	-0.48	Penalty linear term
λ_1	0.525	Penalty quadratic term
γ	0.0385	Re-entry probability
Taste shocks		
η	$5e^{-4}$	Default choice
ρ	$1e^{-4}$	Borrowing choice

Table 3: New Parameter Values

To reduce the behavior of the spread, I need to re-calibrate the default parameters. I then set the default punishment parameters $\lambda_0 = -0.18$ and $\lambda_1 = 0.245$. The results are shown in Table 5.

I then try to slightly increase the β to 0.96. The results are shown in Table 6.

Effect of β Comparing the results in Table 6 and Table 5, I find that raising β from 0.95 to 0.96 reduces the mean and sd of the spread.

Moment		Value (%)
Mean	Debt to GDP	17.61
	Spread	48.60
Standard Deviation	Spread	45.98
	GDP	13.31
	Consumption	14.17
Correlation with GDP	Spread	-74.40
	Trade Balance to GDP	-55.59

Table 4: New Moments (%)

Moment		Value (%)
Mean	Debt to GDP	18.65
	Spread	4.79
Standard Deviation	Spread	7.99
	GDP	16.76
	Consumption	17.20
Correlation with GDP	Spread	-60.64
	Trade Balance to GDP	-54.91

Table 5: New Moments with Updated Default Parameters (%)

Effect of λ_0 and λ_1 I then try to figure out what will happen if I change the default punishment parameters. I first try to set $\lambda_0 = -0.2$ from $\lambda_0 = -0.18$. The result changes dramatically. The results are shown in Table 7.

Basically, increasing λ_0 from -0.18 to -0.2 makes the mean and sd of the spread much higher. It will also reduce the mean debt to GDP ratio. I then try $\lambda_0 = -0.19$ to recover to a normal level. The results are shown in Table 8.

Then what if I change the $\lambda_0 = -0.17$? The results are not so good. The results are shown in Table 10. But the spread is definitely not behaving as expected. In conclusion, I'll then fix the default punishment parameters to $\lambda_0 = -0.18$ for now.

Effect of λ_1 I then try to figure out what will happen if I change the λ_1 from 0.245 to 0.25. The results are shown in Table 11. The basic observation is that increasing λ_1 from 0.245 to 0.25 makes the mean and sd of the spread much lower.

So I try to figure out what will happen if I change the λ_1 from 0.245 to 0.24. The results are shown in Table 12. Compared with Table 5, the mean and the sd of the spread are higher, with the std of the spread being much higher than the mean.

Moment		Value (%)
Mean	Debt to GDP	18.66
	Spread	3.52
Standard Deviation	Spread	5.07
	GDP	16.73
	Consumption	17.13
Correlation with GDP	Spread	-66.98
	Trade Balance to GDP	-39.94

Table 6: New Moments with Higher β (%)

Moment		Value (%)
Mean	Debt to GDP	17.56
	Spread	39.89
Standard Deviation	Spread	32.71
	GDP	13.77
	Consumption	14.71
Correlation with GDP	Spread	-78.09
	Trade Balance to GDP	-58.19

Table 7: New Moments with Lower λ_0 (%)

What to do now? Given the initial guess in Table 5, I'll need to reduce the B/Y ratio, increase the mean of the spread and reduce the sd of the spread.

Moment		Value (%)
Mean	Debt to GDP	18.33
	Spread	14.85
Standard Deviation	Spread	17.41
	GDP	15.35
	Consumption	16.08
Correlation with GDP	Spread	-70.07
	Trade Balance to GDP	-63.98

Table 8: New Moments with $\lambda_0 = -0.19$ (%)

Moment		Value (%)
Mean	Debt to GDP	18.81
	Spread	0.00
Standard Deviation	Spread	0.00
	GDP	17.81
	Consumption	17.67
Correlation with GDP	Spread	-99.98
	Trade Balance to GDP	-21.86

Table 9: New Moments with $\lambda_0 = -0.17$ (%)

Moment		Value (%)
Mean	Debt to GDP	18.79
	Spread	0.50
Standard Deviation	Spread	0.89
	GDP	17.57
	Consumption	17.39
Correlation with GDP	Spread	-60.14
	Trade Balance to GDP	-27.43

Table 10: New Moments with $\lambda_1 = 0.25$ (%)

Moment		Value (%)
Mean	Debt to GDP	18.55
	Spread	8.54
Standard Deviation	Spread	12.25
	GDP	16.70
	Consumption	16.13
Correlation with GDP	Spread	-65.11
	Trade Balance to GDP	-62.19

Table 11: New Moments with $\lambda_1 = 0.24$ (%)