Endogenous Risk Aversion in Real Business Cycle Models*

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Abstract

This paper examines how endogenous risk aversion affects real business cycle (*RBC*) model dynamics. By modeling the coefficient of relative risk aversion as a first-order linear approximation of any non-linear cyclical function of output, I find that procyclical risk aversion increases output volatility and alters labor market dynamics and consumption patterns. The model addresses some limitations of standard *RBC* models, such as insufficient consumption and labor volatility. This study suggests that incorporating time-varying risk attitudes can enhance macroeconomic models' explanatory power, improving their alignment with empirical observations.

Keywords: Business Cycle Statistics, Real Business Cycles, Time-Varying Risk, Risk Preferences

JEL Classifications: E30, E32, E37, E60, E71

Reel Konjonktür Dalgalanmaları Modellerinde İçsel Risk Tercihleri

Özet

Bu makale, içsel risk tercihinin reel konjonktür dalgalanmaları (*RBC*) modeli dinamiklerini nasıl etkilediğini incelemektedir. Göreceli risk tercih katsayısını, gelirin doğrusal olmayan herhangi döngüsel bir fonksiyonunun birinci dereceden doğrusal bir yaklaşımı olarak modelleyerek, döngüsel risk tercihinin çıktı oynaklığını artırdığını ve işgücü piyasası dinamiklerini ve tüketim kalıplarını değiştirdiğini ortaya koymaktadır. Model, yetersiz tüketim ve çalışma saati volatilitesi gibi standart *RBC* model sınırlamalarını iyileştirmektedir. Böylelikle bu çalışma, zamanla değişen risk tutumlarının makroekonomik modellerin açıklayıcı gücünü artırabileceğini ve ampirik gözlemlerle uyumlarını iyileştirebileceğini önermektedir.

Anahtar Kelimeler: İş Döngüsü İstatistikleri, Reel İş Döngüleri, Zamanla Değişen Risk, Risk Tercihleri

JEL Sınıflaması: E30, E32, E37, E60, E71

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Introduction

The real business cycle (*RBC*) model, a cornerstone of macroeconomic theory since the seminal work of Kydland and Prescott (1982), has traditionally relied on “deep parameters” — fundamental economic characteristics presumed to be invariant across time and states. Among these, the risk aversion coefficient has long been treated as a constant, reflecting an unchanging attitude towards risk among economic agents. This assumption has facilitated model tractability and simplified the analysis of economic fluctuations. However, recent empirical evidence suggests that risk attitudes may be more variable than previously assumed, potentially changing in response to economic conditions.

In this paper, I examine how the predictions of the *RBC* model change if the risk aversion coefficient is not a constant parameter but an endogenous function of output. This question is motivated by a growing body of literature that challenges the assumption of constant risk aversion.[1] These findings raise important questions about the validity of constant risk aversion assumptions in macroeconomic modeling and their implications for our understanding of business cycle dynamics.

Despite these empirical findings, the macroeconomic consequences of time-varying risk aversion remain largely unexplored.[2] This paper aims to contribute to this area by investigating how endogenous, cyclical risk aversion affects the business cycle properties of the *RBC* model. I formulate the risk aversion coefficient as a first-order linear approximation of a non-linear cyclical function of output, allowing for an examination of scenarios ranging from procyclical to countercyclical risk aversion. This approach enables a systematic analysis of how different patterns of time-varying risk aversion might influence key macroeconomic variables and overall economic dynamics.

My approach builds upon previous work that has questioned the constancy of deep parameters in macroeconomic models. For instance, Bai et al. (2012) explored productive demand shocks, while Cho and Cooley (1994) incorporated extensive and intensive labor margins to improve business cycle statistics. Fernandez-Villaverde and Rubio-Ramírez (2007) provided a broader criticism of modeling “structural” parameters as state and time-invariant. My focus on endogenous risk aversion represents a continuation of this line of inquiry, extending the critique to a fundamental aspect of household behavior in *RBC* models.

The paper is structured as follows: First, I present the analytical framework, deriving key equilibrium conditions under endogenous risk aversion. This section provides a detailed exposition of how time-varying risk aversion is incorporated into the standard *RBC* model, highlighting the modifications to household optimization and the resulting changes in

[1] Studies by Eeckhoudt et al. (1996), Malmendier and Nagel (2011), Bucciol and Zarri (2013), Guiso et al. (2013), Hanaoka et al. (2015), and Mengel et al. (2016) present evidence suggesting that risk aversion is neither time nor state invariant, but rather exhibits persistent patterns of variation.

[2] An exception is the work of Torul (2018), who investigates a scenario where the coefficient of relative risk aversion is stochastic or countercyclical.

equilibrium conditions. I then calibrate the model under three distinct scenarios: a baseline case, a linear disutility specification following Hansen (1985) and Rogerson (1988), and a high risk aversion case. This multi-scenario approach allows for a comprehensive examination of how the effects of endogenous risk aversion might vary under different model specifications. For each scenario, I examine steady-state properties, impulse response functions, and business cycle statistics, comparing the results to those of standard *RBC* models and empirical data. This comparative analysis helps to isolate the specific impacts of endogenous risk aversion and to assess its potential to improve the model's fit with observed economic patterns.

My findings indicate that endogenous risk aversion can alter the dynamics of key macroeconomic variables in significant ways. I observe changes in output volatility, labor market dynamics, and the behavior of consumption and investment. Notably, the model with procyclical risk aversion appears to address some known limitations of standard *RBC* models, such as insufficient consumption volatility and excessive investment volatility. These results suggest that incorporating time-varying risk aversion may enhance the explanatory power of *RBC* models and provide new insights into the propagation of economic shocks.

This paper aims to contribute to our understanding of business cycle dynamics by exploring the potential role of time-varying risk attitudes in shaping macroeconomic outcomes. By challenging the assumption of constant risk aversion, it invites a reconsideration of how fundamental economic behaviors are modeled in macroeconomic theory. The results may have implications for how we interpret economic fluctuations and for optimal policy design (Ateşağaoğlu and Torul, 2018). While the focus of this paper is primarily theoretical, the findings point to the importance of further empirical work to estimate the cyclical properties of risk aversion and to test the predictions of models with endogenous risk aversion against historical data.

The rest of the paper is organized as follows: in *Section 2*, I describe the model environment, in *Section 3*, I discuss the computational methodology and parametrization, in *Section 4*, I present the results, and in Section 5, I conclude.

Model

This model employs a standard real business cycle (*RBC*) framework with a representative household and firm in a decentralized market economy.[3]

Households

The representative household maximizes its present-discounted lifetime utility subject to a dynamic budget constraint:

$$\max_{\{c_t,n_t,k_{t+1}\}_{t=0}^{\infty}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left[u(c_t) - v(n_t)\right] \tag{1}$$

[3] Given the absence of government and externalities, the social planner's solution would be identical to the competitive equilibrium, as per the first welfare theorem.

subject to

$$c_t + k_{t+1} = w_t n_t + [1 + (r_t - \delta)]k_t \tag{2}$$

where $\mathbb{E}_0(\cdot)$ denotes the expectations operator (as of period 0), $c > 0$ denotes consumption, $n \in [0,1]$ denotes hours worked (as a fraction of the period), $k > 0$ denotes physical capital, δ denotes depreciation rate, β denotes subjective discount factor, and w and r denote factor prices: real wage, and (net) interest rate, respectively.

The household's preferences are additively separable, with a constant relative risk aversion (*CRRA*) function for consumption and a convex (or linear) disutility function for labor:

$$u(c_t, n_t) = \frac{c_t^{1-\sigma_t} - 1}{1 - \sigma_t} - \frac{\psi}{1 + \upsilon} n_t^{1+\upsilon} \tag{3}$$

where ψ and υ govern the level and convexity of labor disutility, respectively.

Departing from conventional models, the risk aversion coefficient σ_t is time-varying:[4]

$$\sigma_t = \overline{\sigma} - \gamma(y_t - \overline{y}) \tag{4}$$

where $\overline{\sigma}$ refers to the long-run level of the risk aversion coefficient, $\overline{y}$ denotes the endogenously-determined steady-state level of output, and γ determines the responsiveness of risk aversion to income fluctuations. This formulation allows σ_t to be *countercyclical* ($\gamma > 0$), *procyclical* ($\gamma < 0$), or *acyclical* ($\gamma = 0$).[5]

The household's optimality conditions yield:

$$\psi \, {n_t}^{\upsilon} - {c_t}^{-\sigma_t} w_t \; = -\gamma \, (1 - \alpha) \, \frac{y_t}{n_t} \left(\frac{{c_t}^{1-\sigma_t} \log(c_t)}{\sigma_t - 1} + \frac{{c_t}^{1-\sigma_t} - 1}{(\sigma_t - 1)^2} \right) \tag{5}$$

$$c_t^{-\sigma_t} - \beta \mathbb{E}_t[{c_{t+1}}^{-\sigma_{t+1}} \, (r_{t+1} - \delta)] = -\gamma \, \alpha \, \beta \mathbb{E}_t \left[\left(\frac{{c_{t+1}}^{1-\sigma_{t+1}} \log(c_{t+1})}{\sigma_{t+1} - 1} + \frac{{c_{t+1}}^{1-\sigma_{t+1}} - 1}{(\sigma_{t+1} - 1)^2} \right) \frac{y_{t+1}}{k_{t+1}} \right] \tag{6}$$

The left-hand sides of equations *(5)* and *(6)* represent standard consumption-leisure and consumption-saving optimality conditions. The right-hand sides introduce novel intratemporal and intertemporal wedges due to the endogenous risk aversion parameter, which vanish when $\gamma = 0$.

[4] Note that *(4)* implies $\sigma_t(\cdot)$ can be considered as a first-order Taylor approximation of a non-linear risk aversion function formulation, hence preserves generality despite its simplicity.

[5] This aligns with Malmendier and Nagel (2011).

Firms

The representative firm solves a standard optimization problem: it faces a constant returns to scale production technology, and maximizes its profits as a price taker, thereby making zero economic profits. The static optimization of the firm is formally as follows:

$$\max_{\{k_t,n_t\}} e^{z_t}F(k_t,n_t) - w_t n_t - r_t k_t - \delta k_t \tag{7}$$

where e^z denotes total factor productivity (*TFP*), and k and n denote physical capital and labor demanded by the firm, respectively. *TFP* shock is lognormally distributed and autoregressive of order one, as it is standard in the literature:

$$z_{t+1} = \rho_z z_t + \varepsilon_{t+1}^z \tag{8}$$

where ε^z is normally distributed with zero mean, and a homoskedastic variance σ_z^2, i.e., $\varepsilon^z \sim N(0,\sigma_z^2)$.[6]

Suppose that the firm's production technology takes the Cobb-Douglas form: $F(k,n) = k^\alpha n^{1-\alpha}$. Then, as a result of the price-taking firm's optimal decisions, the real interest rate and wage are determined competitively and are equal to the marginal product of capital and labor, respectively:

$$r_t = e^{z_t}\alpha k_t^{\alpha-1} n_t^{1-\alpha} - \delta \tag{9}$$

$$w_t = e^{z_t}(1-\alpha)k_t^\alpha n_t^{-\alpha} \tag{10}$$

Finally, note that the dynamic budget constraint of the household *(2)* and the factor prices *(9)* and *(10)* jointly imply that the aggregate resource constraint has to hold:

$$y_t = e^{z_t}k_t^\alpha n_t^{1-\alpha} = c_t + i_t \tag{11}$$

where $i_t = k_{t+1} - (1-\delta)k_t$ denotes investment and $y_t = e^{z_t}k_t^\alpha n_t^{1-\alpha}$ denotes output in period t.

The competitive equilibrium of this model economy is defined such that:

- The representative agent maximizes their present-discounted life-time utility *(1)* subject to the dynamic budget constraint *(2)* and the transversality condition, and follows the resultant intratemporal and intertemporal decision rules *(5)* and *(6)*;
- The representative firm maximizes its static profits *(7)*, which results in competitive factor prices in *(9)* and *(10)*
- The law of motion for the risk aversion parameter follows *(4)* and *TFP* shock follows *(8)*;
- The aggregate resource constraint *(11)* holds.

[6] Note that the steady-state value of the *TFP* shock then satisfies $e^{\bar{z}} = 1$ since $\bar{z} = 0$.

To explore the business cycle properties of the model, I first compute the deterministic steady state, and then rely on local approximation algorithm around this steady state.

To calculate the deterministic steady state, one can set the variables to their long-run means, and simplify the system of equations as follows:

$$\psi\,\overline{n}^{\upsilon} - \overline{c}^{-\overline{\sigma}}\,\overline{w} = -\gamma\,(1-\alpha)\,\frac{\overline{y}}{\overline{n}}\left(\frac{\overline{c}^{1-\overline{\sigma}}\log(\overline{c})}{\overline{\sigma}-1} + \frac{\overline{c}^{1-\overline{\sigma}}-1}{(\overline{\sigma}-1)^2}\right) \tag{12}$$

$$\overline{c}^{-\overline{\sigma}}[1-\beta(\overline{r}-\delta))] = -\gamma\,\alpha\,\beta\left[\left(\frac{\overline{c}^{1-\overline{\sigma}}\log(\overline{c})}{\overline{\sigma}-1} + \frac{\overline{c}^{1-\overline{\sigma}}-1}{(\overline{\sigma}-1)^2}\right)\frac{\overline{y}}{\overline{k}}\right] \tag{13}$$

$$\overline{c} + \delta\overline{k} = \overline{y} \tag{14}$$

$$\overline{y} = \overline{k}^{\alpha}\,\overline{n}^{(1-\alpha)} \tag{15}$$

$$\overline{r} = \alpha\overline{k}^{\alpha-1}\,\overline{n}^{(1-\alpha)} - \delta \tag{16}$$

$$\overline{w} = (1-\alpha)\overline{k}^{\alpha}\,\overline{n}^{-\alpha} \tag{17}$$

These six equations uniquely determine the six unknowns of the model: $\overline{k}, \overline{n}, \overline{y}, \overline{c}, \overline{r}$, and $\overline{w}$.

After calculating the deterministic steady state, I derive the decision rules and resultant business cycle statistics around the deterministic steady state using the Schmitt-Grohé and Uribe (2004) local approximation technique.[7]

Parametrization and Computation

This study adopts standard parameter estimates for the United States economy, following mainstream macroeconomics literature (e.g., King and Rebelo, 1999). The model period is set to one quarter, with conventional *RBC* parameter values. The quarterly subjective discount rate (β) is set to 0.99, while the share of physical capital in production (α) is 0.36. The quarterly depreciation rate (δ) is assumed to be 0.02. For the total factor productivity, the autoregressive persistence (ρ_z) is set to 0.95, and its shock's standard deviation (σ_z) is 0.007.

Regarding consumption preferences, the baseline steady-state coefficient of risk aversion ($\overline{\sigma}$) is set to 1.50, aligning with Arrow (1999) and common practice in macroeconomic literature.[8] The convexity parameter of labor disutility (υ) is set to 4/3, implying a Frisch elasticity of labor

[7] Throughout my computations, I use the *MATLAB* add-on *DYNARE* version 6.1.0. For steady-state calculations, I rely on fixed-point iteration: I guess the steady-state level of output, calculate the resultant steady state prediction, and update my prediction with the new result if the initial guess is inaccurate. For business cycle calculations, I rely on *DYNARE*'s in-built third-order local approximation algorithm *à la* Schmitt-Grohé and Uribe (2004).

[8] For further discussion on risk aversion values, see Layard et al. (2008) and Gandelman and Hernández-Murillo (2015).

supply of 0.75, as proposed by Chetty et al. (2011) for macroeconomic models. This configuration is termed the *baseline model*.

Two alternative specifications are also explored. The first, termed the *linear disutility model*, sets $\upsilon = 0$, following the "indivisible labor" concept of Hansen (1985) and Rogerson (1988), where the representative household is risk-neutral in labor. The second, the *high risk aversion model*, sets the steady-state coefficient of risk aversion ($\overline{\sigma}$) to 3, to examine the implications for the intertemporal margin as highlighted by Huggett (1993), among others.

In all three models, the level parameter governing labor disutility (ψ) is calibrated to achieve $n = 0.30$ in the acyclical case ($\gamma = 0$), consistent with standard literature. To investigate the role of risk aversion cyclicality, five values of γ are tested across all models: $-3, -1.5, 0, 1.5,$ and 3. Positive values represent procyclical risk aversion, negative values represent countercyclical risk aversion, and $\gamma = 0$ represents acyclical risk aversion, equivalent to the benchmark plain-vanilla *RBC* model. Table 1 summarizes the parametrization for all model variants.

Table 1: Parameter Sets

	Baseline	Linear Disutility	High Risk Aversion
α	0.36	0.36	0.36
β	0.99	0.99	0.99
δ	0.02	0.02	0.02
ρ_z	0.95	0.95	0.95
σ_z	0.007	0.007	0.007
$\overline{\sigma}$	1.50	1.50	3.00
υ	4/3	0.00	4/3
ψ	14.5429	2.9207	16.4334
γ	{-3, -1.5, 0, 1.5, 3}	{-3, -1.5, 0, 1.5, 3}	{-3, -1.5, 0, 1.5, 3}

Results

Baseline Model

Using the parameter values listed in Table *1*'s first column, I calculate the baseline economy's steady state through fixed-point iteration, with results reported in Table *2*. As the magnitude of γ increases, the steady-state output that equates the long-run value of σ_t to $\overline{\sigma} = 1.5$ also increases. This stems from higher steady-state levels of both production factors, with physical capital showing a notably larger increase (in both level and percentage) compared to labor. These steady-state differences arise from the intertemporal and intratemporal wedges in equations (*5*) and (*6*).[9]

Table 2: Steady State of the Baseline Economy

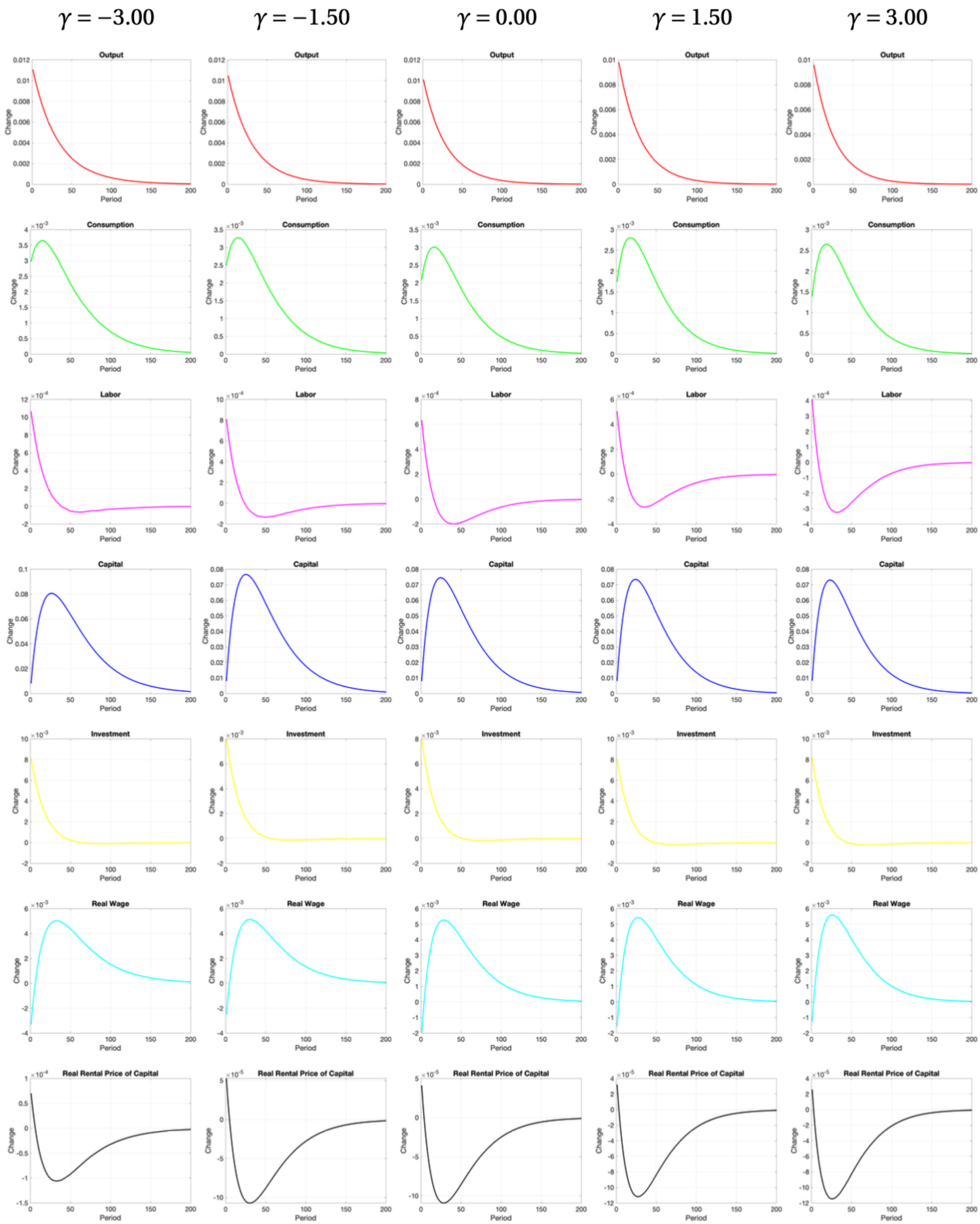
γ	$\overline{y}$	$\overline{c}$	$\overline{k}$	$\overline{i}$	$\overline{n}$	$\overline{y}/\overline{n}$	$\overline{r}$	$\overline{w}$

[9] Note that as long as $\gamma \neq 0$, the endogeneity of the risk aversion coefficient alters the representative household's optimal decision rules.

-3.00	1.1989	0.9152	14.1862	0.2837	0.2987	4.0143	0.0104	2.5691
-1.50	1.2057	0.9187	14.3499	0.2870	0.2994	4.0274	0.0102	2.5775
0.00	1.2115	0.9217	14.4897	0.2898	0.3000	4.0385	0.0101	2.5846
1.50	1.2166	0.9244	14.6117	0.2922	0.3005	4.0481	0.0100	2.5908
3.00	1.2210	0.9266	14.7196	0.2944	0.3010	4.0566	0.0099	2.5962

Before examining the impact of time-varying risk aversion on business cycle statistics, I analyze the impulse response functions (*IRFs*) of the model's endogenous variables, presented in Figure *1*. These *IRFs* show the 200-quarter responses of key variables from their steady-state values following a one-standard-deviation positive total factor productivity shock. Each column depicts the *IRFs* for a specific γ value.

Figure 1: Impulse-Response Functions with Baseline Parameters



The first row of Figure *1* reveals that a highly procyclical σ (i.e., $\gamma = -3$) yields the largest initial output increase, which decays most slowly over time. To understand this phenomenon, I focus on the responses of production factors, capital and labor. The fourth row shows that capital responses remain relatively consistent across γ values. In contrast, the third row demonstrates significant variations in labor responses. A procyclical σ leads to larger initial increases in labor that decay slowly, while a countercyclical σ (shown in the last column) results in moderate initial jumps that turn negative within five years before oscillating back to zero. Other endogenous variables exhibit less variation across σ's cyclicality compared to labor. Investment *IRFs* show negligible changes across γ values, while consumption *IRFs* display similar patterns but with different magnitudes. Factor prices (real wage and real rental price of capital) show the most pronounced initial variations with procyclical σ and the largest oscillations with countercyclical σ, mirroring the labor response patterns. These findings suggest that labor, consumption, and factor prices are the most likely candidates to drive variations in business cycle statistics.

Table 3: Business Cycle Statistics of the Baseline Economy

							γ=-3.00							
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0125	1.0000	-0.0080	0.1196	0.2753	0.4784	0.7256	1.0000	0.7256	0.4784	0.2753	0.1196	-0.0080	0.7253
c	0.0046	0.3698	-0.1282	-0.0014	0.1623	0.3825	0.6559	0.9707	0.7707	0.5766	0.4057	0.2668	0.1460	0.7547
i	0.0389	3.0982	0.0401	0.1652	0.3150	0.5084	0.7409	0.9952	0.6961	0.4324	0.2200	0.0598	-0.0681	0.7200
k	0.0027	0.2153	-0.5183	-0.4601	-0.3595	-0.2052	0.0129	0.2993	0.4942	0.6088	0.6600	0.6641	0.6309	0.9569
n	0.0049	0.3938	0.0551	0.1770	0.3244	0.5156	0.7425	0.9900	0.6861	0.4203	0.2054	0.0454	-0.0794	0.7201
y/n	0.0077	0.6126	-0.0485	0.0814	0.2409	0.4495	0.7072	0.9959	0.7434	0.5107	0.3174	0.1660	0.0380	0.7319
r	0.0001	0.0092	0.2953	0.3875	0.4850	0.6001	0.7205	0.8287	0.4404	0.1269	-0.1071	-0.2651	-0.3715	0.7615
w	0.0021	0.1680	-0.2954	-0.3879	-0.4854	-0.6004	-0.7208	-0.8289	-0.4402	-0.1263	0.1077	0.2659	0.3727	0.7615
							γ=-1.50							
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0118	1.0000	-0.0097	0.1187	0.2746	0.4773	0.7252	1.0000	0.7252	0.4773	0.2746	0.1187	-0.0097	0.7250
c	0.0039	0.3301	-0.1545	-0.0264	0.1386	0.3605	0.6392	0.9614	0.7764	0.5925	0.4291	0.2938	0.1727	0.7624
i	0.0378	3.2119	0.0396	0.1651	0.3149	0.5080	0.7408	0.9951	0.6952	0.4308	0.2184	0.0582	-0.0702	0.7195
k	0.0026	0.2230	-0.5178	-0.4595	-0.3587	-0.2043	0.0141	0.3010	0.4959	0.6102	0.6610	0.6645	0.6306	0.9568
n	0.0037	0.3159	0.0820	0.2040	0.3478	0.5317	0.7503	0.9851	0.6657	0.3889	0.1692	0.0069	-0.1193	0.7187
y/n	0.0081	0.6909	-0.0515	0.0785	0.2384	0.4477	0.7066	0.9969	0.7453	0.5130	0.3200	0.1686	0.0406	0.7322
r	0.0001	0.0081	0.3537	0.4345	0.5130	0.5994	0.6832	0.7447	0.3461	0.0300	-0.1993	-0.3501	-0.4477	0.7893
w	0.0018	0.1488	-0.3534	-0.4346	-0.5131	-0.5994	-0.6834	-0.7448	-0.3459	-0.0296	0.1997	0.3507	0.4487	0.7892
							γ=0							
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0112	1.0000	-0.0108	0.1181	0.2740	0.4766	0.7250	1.0000	0.7250	0.4766	0.2740	0.1181	-0.0108	0.7247
c	0.0033	0.2911	-0.1869	-0.0585	0.1074	0.3308	0.6146	0.9445	0.7806	0.6113	0.4584	0.3284	0.2083	0.7738
i	0.0375	3.3320	0.0397	0.1654	0.3150	0.5079	0.7407	0.9949	0.6943	0.4293	0.2169	0.0565	-0.0719	0.7192
k	0.0026	0.2311	-0.5171	-0.4586	-0.3577	-0.2031	0.0155	0.3026	0.4975	0.6114	0.6618	0.6647	0.6303	0.9567
n	0.0029	0.2592	0.1170	0.2374	0.3756	0.5493	0.7550	0.9715	0.6351	0.3468	0.1222	-0.0417	-0.1680	0.7197
y/n	0.0084	0.7507	-0.0548	0.0753	0.2354	0.4453	0.7050	0.9966	0.7464	0.5152	0.3229	0.1717	0.0437	0.7326
r	0.0001	0.0074	0.4041	0.4717	0.5298	0.5865	0.6324	0.6467	0.2464	-0.0652	-0.2855	-0.4260	-0.5125	0.8207
w	0.0016	0.1381	-0.4037	-0.4716	-0.5298	-0.5865	-0.6326	-0.6470	-0.2465	0.0654	0.2857	0.4264	0.5131	0.8204
							γ=1.50							
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0109	1.0000	-0.0115	0.1176	0.2736	0.4761	0.7248	1.0000	0.7248	0.4761	0.2736	0.1176	-0.0115	0.7245
c	0.0028	0.2534	-0.2276	-0.1003	0.0654	0.2897	0.5778	0.9155	0.7809	0.6326	0.4945	0.3725	0.2550	0.7905
i	0.0375	3.4555	0.0400	0.1657	0.3152	0.5079	0.7406	0.9945	0.6933	0.4279	0.2153	0.0549	-0.0735	0.7188
k	0.0026	0.2395	-0.5162	-0.4576	-0.3565	-0.2017	0.0170	0.3043	0.4989	0.6126	0.6625	0.6649	0.6300	0.9567
n	0.0024	0.2172	0.1612	0.2777	0.4073	0.5670	0.7541	0.9452	0.5907	0.2910	0.0621	-0.1022	-0.2267	0.7248

y/n	0.0087	0.7978	-0.0583	0.0718	0.2320	0.4425	0.7031	0.9960	0.7476	0.5176	0.3260	0.1752	0.0473	0.7332
r	0.0001	0.0071	0.4442	0.4978	0.5358	0.5642	0.5737	0.5439	0.1493	-0.1524	-0.3605	-0.4889	-0.5630	0.8513
w	0.0014	0.1329	-0.4437	-0.4977	-0.5359	-0.5643	-0.5742	-0.5446	-0.1497	0.1524	0.3605	0.4891	0.5636	0.8509
γ=3.00														
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0106	1.0000	-0.0121	0.1171	0.2732	0.4757	0.7246	1.0000	0.7246	0.4757	0.2732	0.1171	-0.0121	0.7243
c	0.0023	0.2179	-0.2796	-0.1556	0.0077	0.2307	0.5211	0.8653	0.7724	0.6549	0.5383	0.4288	0.3165	0.8151
i	0.0379	3.5816	0.0406	0.1662	0.3155	0.5080	0.7406	0.9942	0.6923	0.4265	0.2137	0.0533	-0.0751	0.7185
k	0.0026	0.2481	-0.5153	-0.4566	-0.3553	-0.2004	0.0185	0.3059	0.5004	0.6137	0.6631	0.6651	0.6297	0.9566
n	0.0020	0.1869	0.2134	0.3234	0.4410	0.5819	0.7440	0.9019	0.5297	0.2202	-0.0113	-0.1741	-0.2944	0.7361
y/n	0.0088	0.8353	-0.0623	0.0679	0.2284	0.4394	0.7010	0.9953	0.7489	0.5203	0.3296	0.1792	0.0514	0.7339
r	0.0001	0.0070	0.4733	0.5137	0.5336	0.5368	0.5144	0.4464	0.0621	-0.2267	-0.4212	-0.5371	-0.5992	0.8776
w	0.0014	0.1318	-0.4729	-0.5138	-0.5339	-0.5373	-0.5152	-0.4474	-0.0627	0.2266	0.4212	0.5374	0.5998	0.8770

Table *3* presents the business cycle properties of the baseline model.[10] The table displays standard deviation, relative (to output) standard deviation, lagged, contemporaneous, and lead correlations with output, and autocorrelation functions (*ACF*) for various variables.[11] The output rows in Table *3* indicate that while output's standard deviation increases with σ's procyclicality, other output statistics remain relatively stable across γ values. Capital statistics show little variation, whereas labor exhibits considerable changes in both absolute and relative standard deviation as γ changes. Higher σ procyclicality leads to greater labor variation and stronger positive contemporaneous and lead correlations with output. Consumption displays similar patterns, but with increased lagged (rather than lead) correlations as procyclicality increases.

A key limitation of *RBC* models is their inability to generate sufficient consumption volatility due to households' consumption smoothing behavior. This, combined with intratemporal decisions affecting optimal labor supply, also constrains labor volatility. Moreover, the standard *RBC* model ($\gamma = 0$) overestimates investment volatility and underestimates factor price volatility. The procyclicality of σ helps mitigate these discrepancies. Table *3* thus demonstrates that a procyclical risk aversion coefficient could help align model predictions more closely with empirical data.

Linear Disutility Model

Next, I examine the role of risk aversion cyclicality in the linear disutility model using the parameter values from Table *1*'s second column. Table *4* presents the steady states of this model economy. Notably, the acyclical σ case yields identical steady state values to the baseline model in Table *2*. This equivalence results from recalibrating the disutility level parameter to $\psi = 2.9207$, ensuring the steady-state labor level remains at $n = 0.3$.[12]

[10] In calculating business cycle statistics, I follow common practice in the literature: I take the natural logarithm of series of interest, apply the Hodrick-Prescott filter with smoothing parameter $\lambda = 1600$ to the log series, and then construct the (detrended) residual series to calculate relevant descriptive statistics.

[11] For comparison, U.S. business cycle statistics by King and Rebelo (1999) are provided in Table *A.1*.

[12] When $\gamma = 0$, the model reverts to the plain-vanilla *RBC* model. In this setting, the steady-state interest rate equals $\bar{r} = 1/\beta - 1 + \delta$ due to the intertemporal margin (i.e., the *Euler equation*). Given n's recalibration to 0.3, identical $\bar{r}$ values necessitate identical capital stock levels, resulting in identical steady states.

As in the baseline case, Table *4* shows that higher σ values generate higher steady-state output levels, primarily driven by increased steady-state capital, with minimal changes in labor across γ values. However, the variation in steady-state output and other endogenous variables over γ is more pronounced under the linear disutility parameter set compared to the baseline scenario.

Table 4: Steady State of the Linear Disutility Model

γ	$\bar{y}$	$\bar{c}$	$\bar{k}$	$\bar{i}$	$\bar{n}$	$\bar{y}/\bar{n}$	$\bar{r}$	$\bar{w}$
-3.00	1.1921	0.9104	14.0887	0.2818	0.2972	4.0115	0.0105	2.5674
-1.50	1.2032	0.9168	14.3160	0.2863	0.2988	4.0269	0.0103	2.5772
0.00	1.2115	0.9217	14.4897	0.2898	0.3000	4.0385	0.0101	2.5846
1.50	1.2183	0.9257	14.6297	0.2926	0.3010	4.0478	0.0100	2.5906
3.00	1.2239	0.9289	14.7466	0.2949	0.3018	4.0555	0.0099	2.5955

Figure *2* illustrates the *IRFs* of this model to a total factor productivity shock. The first row reveals that output's on-impact response varies significantly across γ values: a highly procyclical σ ($\gamma = -3$) generates about 150% larger initial output increase, decaying much more slowly compared to the highly countercyclical σ ($\gamma = 3$) case. The disparity in immediate jumps across γ values primarily stems from labor responses, while capital responses contribute to slower decay under the procyclical scenario.

Consumption *IRFs* also show considerable variation across γ values, with the peak jump for $\gamma = -3$ being almost triple that for $\gamma = 3$.[13] Investment and factor prices exhibit notable variation over σ's cyclicality as well. These findings indicate that the Hansen-Rogerson parametrization amplifies the variation of *IRFs* across γ values.

[13] The heightened disparities of *IRFs* over γ between the baseline and linear disutility models can be attributed to the Hansen-Rogerson parametrization's intratemporal implications on household responses to shocks. In the plain-vanilla *RBC* model, the intratemporal margin dictates that $\psi n_t^{\upsilon} c_t^{\sigma} = w_t$. When $\upsilon = 0$, a wage shock is absorbed solely by consumption response, whereas when $\upsilon > 0$, the shock is handled by joint responses in consumption and hours worked. Consequently, the convexity of disutility over hours worked amplifies economic responses, generating more pronounced magnitudes under the Hansen-Rogerson parameter set.

Figure 2: Impulse-Response Functions with Linear Disutility

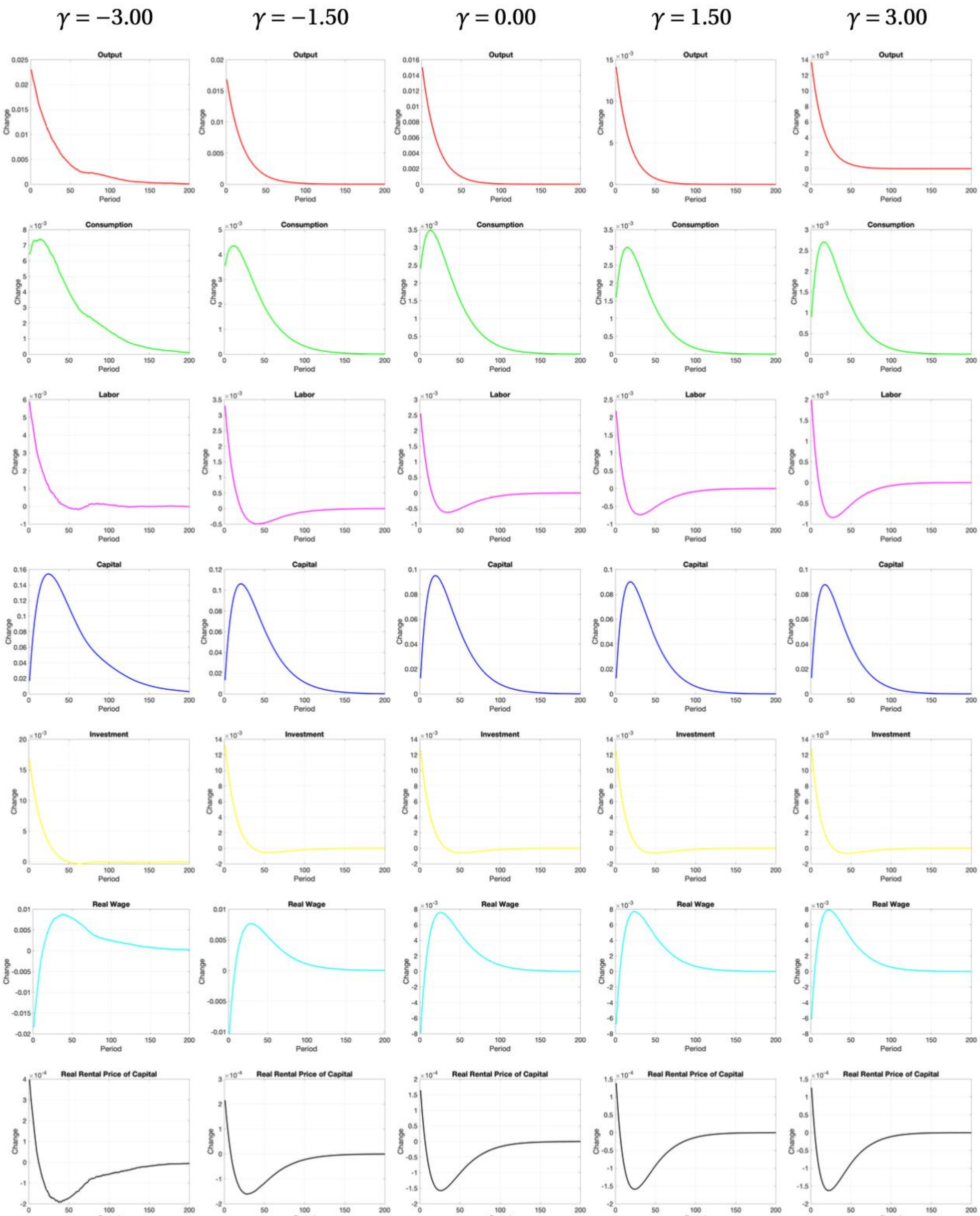


Table *5* presents the business cycle statistics of the linear disutility model. The output rows show that the standard deviation of output again increases with the procyclicality of σ. Conversely, the standard deviation of capital decreases with σ's procyclicality, which differs notably from the baseline case. Labor's standard deviation under $\sigma = -3$ closely matches that of output, aligning better with actual U.S. data. Furthermore, labor's standard deviation, as well as its contemporaneous and lead correlations with output, increase with σ's procyclicality. The business cycle properties of consumption also exhibit similarities with the baseline case: both consumption variation and its lagged correlations with output increase with σ's procyclicality. Additionally, procyclical σ generates more accurate contemporaneous correlations with output in terms of goodness of fit with the data. The procyclicality of σ also improves the accuracy of relative volatility for investment and factor prices, limiting investment volatility overshooting and factor price undershooting. Overall, Table *5* demonstrates that σ's procyclicality enhances the *RBC* model's goodness of fit, with the linear disutility model outperforming the baseline model in matching empirical data.

Table 5: Business Cycle Statistics of the Linear Disutility Model

γ=-3.00													
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0272	1.0000	-0.0004	0.1195	0.2740	0.4841	0.7269	1.0000	0.7269	0.4841	0.2740	0.1195	-0.0004	0.7263
c	0.0105	0.3875	-0.1146	0.0028	0.1633	0.3904	0.6564	0.9656	0.7661	0.5765	0.3971	0.2599	0.1486	0.7553
i	0.0861	3.1686	0.0511	0.1689	0.3164	0.5160	0.7399	0.9918	0.6911	0.4331	0.2140	0.0553	-0.0653	0.7170
k	0.0058	0.2130	-0.5150	-0.4579	-0.3589	-0.2050	0.0114	0.2955	0.4897	0.6051	0.6558	0.6603	0.6302	0.9577
n	0.0283	1.0427	0.0498	0.1644	0.3117	0.5139	0.7390	0.9899	0.6944	0.4384	0.2180	0.0607	-0.0564	0.7223
y/n	0.0038	0.1396	-0.3707	-0.3610	-0.3470	-0.3366	-0.2702	-0.1733	0.0601	0.2220	0.3488	0.4089	0.4167	0.8218
r	0.0006	0.0210	0.1572	0.2627	0.3935	0.5677	0.7551	0.9528	0.6110	0.3235	0.0872	-0.0749	-0.1881	0.7276
w	0.0103	0.3786	-0.1574	-0.2637	-0.3948	-0.5688	-0.7562	-0.9545	-0.6111	-0.3229	-0.0867	0.0762	0.1904	0.7263
γ=-1.50													
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0190	1.0000	-0.0134	0.1131	0.2687	0.4729	0.7221	1.0000	0.7221	0.4729	0.2687	0.1131	-0.0134	0.7218
c	0.0056	0.2955	-0.1777	-0.0535	0.1109	0.3356	0.6176	0.9477	0.7755	0.6021	0.4441	0.3127	0.1956	0.7676
i	0.0638	3.3560	0.0354	0.1594	0.3087	0.5031	0.7368	0.9942	0.6911	0.4259	0.2125	0.0526	-0.0741	0.7157
k	0.0044	0.2297	-0.5196	-0.4626	-0.3628	-0.2085	0.0107	0.2998	0.4955	0.6097	0.6596	0.6620	0.6274	0.9562
n	0.0152	0.7976	0.0729	0.1937	0.3384	0.5251	0.7467	0.9869	0.6667	0.3902	0.1700	0.0084	-0.1162	0.7158
y/n	0.0047	0.2487	-0.2876	-0.1665	-0.0045	0.2179	0.5090	0.8559	0.7653	0.6502	0.5351	0.4279	0.3189	0.8139
r	0.0003	0.0168	0.2118	0.3174	0.4361	0.5826	0.7465	0.9102	0.5370	0.2294	-0.0050	-0.1674	-0.2824	0.7332
w	0.0059	0.3101	-0.2113	-0.3176	-0.4363	-0.5826	-0.7468	-0.9107	-0.5370	-0.2289	0.0052	0.1680	0.2837	0.7328
γ=0													
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0168	1.0000	-0.0184	0.1096	0.2654	0.4691	0.7203	1.0000	0.7203	0.4691	0.2654	0.1096	-0.0184	0.7201
c	0.0039	0.2341	-0.2450	-0.1213	0.0432	0.2690	0.5604	0.9055	0.7771	0.6340	0.4987	0.3791	0.2643	0.7922
i	0.0595	3.5475	0.0312	0.1563	0.3055	0.4995	0.7351	0.9940	0.6892	0.4219	0.2089	0.0491	-0.0786	0.7141
k	0.0041	0.2421	-0.5200	-0.4635	-0.3639	-0.2095	0.0106	0.3015	0.4977	0.6114	0.6604	0.6616	0.6254	0.9556
n	0.0117	0.6982	0.0969	0.2180	0.3584	0.5367	0.7500	0.9770	0.6409	0.3530	0.1294	-0.0335	-0.1590	0.7145
y/n	0.0059	0.3511	-0.2450	-0.1213	0.0432	0.2690	0.5604	0.9055	0.7771	0.6340	0.4987	0.3791	0.2643	0.7922
r	0.0003	0.0152	0.2536	0.3546	0.4622	0.5904	0.7326	0.8664	0.4773	0.1608	-0.0736	-0.2333	-0.3446	0.7452
w	0.0047	0.2822	-0.2528	-0.3545	-0.4621	-0.5902	-0.7327	-0.8667	-0.4775	-0.1606	0.0735	0.2335	0.3455	0.7449
γ=1.50													
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0156	1.0000	-0.0214	0.1069	0.2626	0.4665	0.7189	1.0000	0.7189	0.4665	0.2626	0.1069	-0.0214	0.7187
c	0.0029	0.1832	-0.3343	-0.2178	-0.0593	0.1619	0.4553	0.8096	0.7548	0.6660	0.5689	0.4716	0.3665	0.8361
i	0.0584	3.7353	0.0292	0.1542	0.3033	0.4973	0.7338	0.9937	0.6871	0.4185	0.2054	0.0456	-0.0820	0.7126
k	0.0040	0.2540	-0.5197	-0.4635	-0.3641	-0.2096	0.0111	0.3032	0.4996	0.6128	0.6609	0.6610	0.6236	0.9553

n	0.0100	0.6427	0.1221	0.2414	0.3770	0.5474	0.7506	0.9634	0.6137	0.3172	0.0902	-0.0730	-0.1975	0.7154
y/n	0.0065	0.4180	-0.2390	-0.1155	0.0487	0.2745	0.5660	0.9111	0.7763	0.6284	0.4898	0.3683	0.2528	0.7879
r	0.0002	0.0144	0.2882	0.3832	0.4805	0.5931	0.7148	0.8222	0.4231	0.1026	-0.1306	-0.2865	-0.3924	0.7585
w	0.0042	0.2696	-0.2873	-0.3830	-0.4803	-0.5929	-0.7150	-0.8227	-0.4235	-0.1027	0.1302	0.2863	0.3930	0.7581
γ=3.00														
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0151	1.0000	-0.0239	0.1041	0.2597	0.4640	0.7174	1.0000	0.7174	0.4640	0.2597	0.1041	-0.0239	0.7171
c	0.0022	0.1443	-0.4479	-0.3538	-0.2183	-0.0221	0.2491	0.5890	0.6592	0.6672	0.6398	0.5860	0.5059	0.9042
i	0.0591	3.9240	0.0276	0.1522	0.3011	0.4954	0.7325	0.9935	0.6849	0.4152	0.2015	0.0419	-0.0850	0.7110
k	0.0040	0.2658	-0.5191	-0.4634	-0.3642	-0.2096	0.0115	0.3048	0.5014	0.6140	0.6612	0.6602	0.6218	0.9549
n	0.0093	0.6153	0.1461	0.2625	0.3931	0.5561	0.7490	0.9481	0.5863	0.2828	0.0530	-0.1098	-0.2318	0.7173
y/n	0.0069	0.4602	-0.2473	-0.1248	0.0388	0.2647	0.5575	0.9052	0.7748	0.6301	0.4937	0.3734	0.2585	0.7900
r	0.0002	0.0142	0.3151	0.4040	0.4924	0.5922	0.6966	0.7821	0.3766	0.0546	-0.1765	-0.3281	-0.4282	0.7707
w	0.0040	0.2667	-0.3141	-0.4039	-0.4924	-0.5922	-0.6972	-0.7831	-0.3774	-0.0550	0.1760	0.3279	0.4287	0.7702

High Risk Aversion Model

To examine the high risk aversion scenario, I employ the parameter values listed in the third column of Table *1*. Table *6* presents the resulting steady-state values under this parametrization. The acyclical σ model economy remains identical to its previous two counterparts, as labor is recalibrated to maintain the same steady-state value of $n = 0.3$. Consistent with earlier findings, the steady-state values of model variables (except for $\bar{r}$) increase with γ, albeit at a slower rate compared to the baseline case. This slower rate of change can be attributed to the nature of this utility function class, where the coefficient of relative risk aversion is the multiplicative inverse of the elasticity of intertemporal substitution. Consequently, changes in γ induce less pronounced changes in the steady-state values of the model's endogenous variables.

Table 6: Steady State of the High Risk Aversion Model

γ	$\bar{y}$	$\bar{c}$	$\bar{k}$	$\bar{i}$	$\bar{n}$	$\bar{y}/\bar{n}$	$\bar{r}$	$\bar{w}$
-3.00	1.2029	0.9179	14.2484	0.2850	0.2995	4.0167	0.0104	2.5707
-1.50	1.2153	0.9234	14.5958	0.2919	0.3002	4.0480	0.0100	2.5907
0.00	1.2116	0.9218	14.4898	0.2898	0.3000	4.0385	0.0101	2.5846
1.50	1.2153	0.9234	14.5958	0.2919	0.3002	4.0480	0.0100	2.5907
3.00	1.2189	0.9250	14.6940	0.2939	0.3005	4.0567	0.0099	2.5963

Figure *3* illustrates the *IRFs* of model variables under the high risk aversion environment. Given that higher risk aversion increases the concavity of the utility function, thereby inducing more conservative responses, the *IRFs* in this parametrization are more moderate compared to the baseline scenario. Furthermore, the variation of IRFs across γ values is less pronounced, with the notable exception of labor. For labor, both the on-impact variations and subsequent oscillations remain substantial.

Figure 3: Impulse-Response Functions with High Risk Aversion

$\gamma = -3.00$ | $\gamma = -1.50$ | $\gamma = 0.00$ | $\gamma = 1.50$ | $\gamma = 3.00$

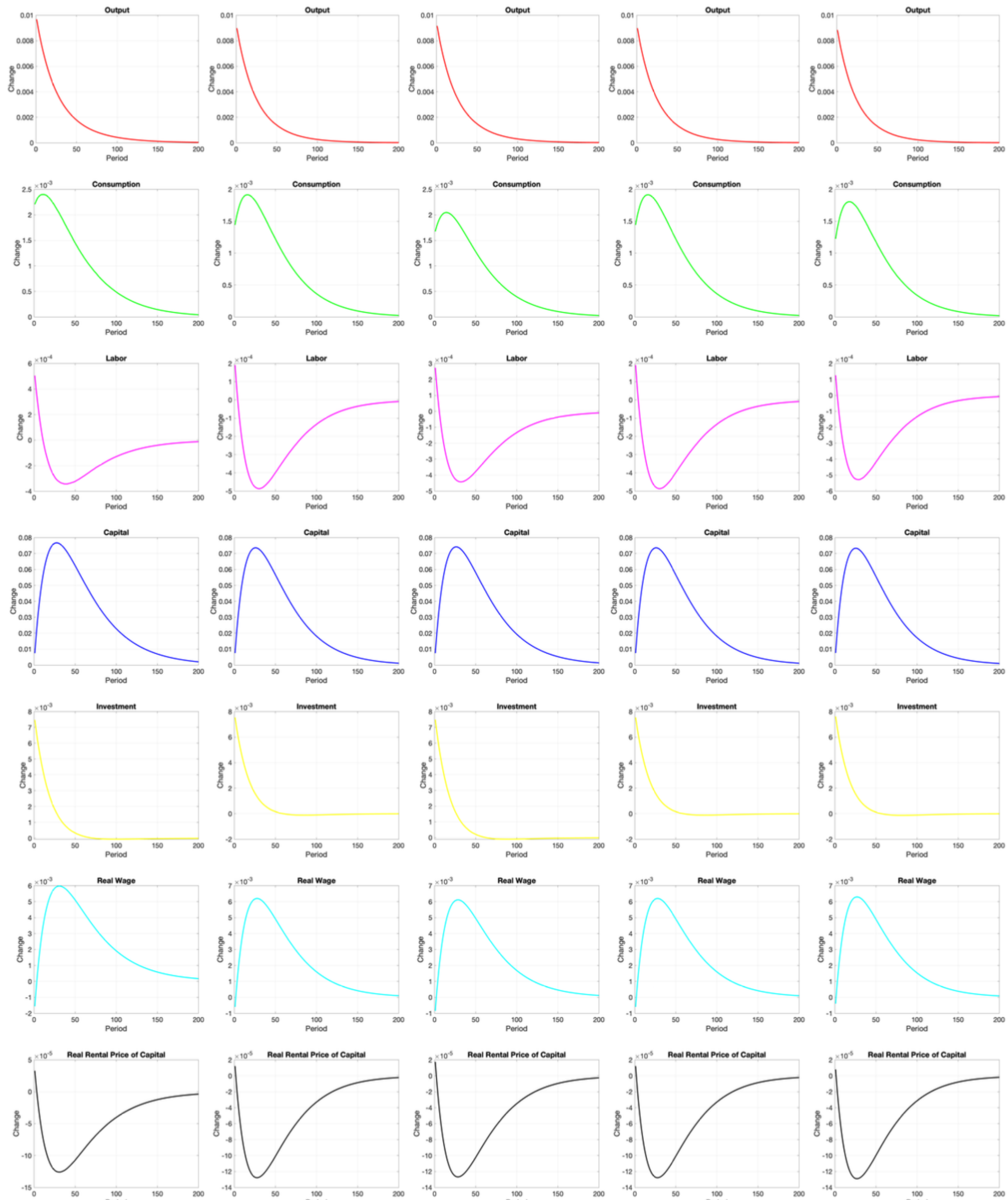


Table *7* presents the business cycle statistics of the high risk aversion model. Consistent with the previous two models, lower γ values correspond to higher output volatility. However, due to the moderating influence of higher risk aversion (and lower intertemporal substitution), these variations are less extreme compared to the baseline scenario. Similar to the baseline case, capital volatility remains relatively stable across γ values, while the volatility of labor, consumption, and factor prices increases with the procyclicality of σ.

Although the high risk aversion model generates many patterns shared by the previous two models, its business cycle predictions are not as accurate as those of the Hansen (1985)-Rogerson (1988) parametrization. This suggests that while the cyclicality of risk aversion continues to play a significant role in shaping business cycle dynamics, the overall level of risk aversion can impact the model's ability to match empirical data.

Table 7: Business Cycle Statistics of the High Risk Aversion Model

	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0109	1.0000	-0.0120	0.1160	0.2719	0.4750	0.7238	1.0000	0.7238	0.4750	0.2719	0.1160	-0.0120	0.7235
c	0.0033	0.3065	-0.1167	0.0115	0.1748	0.3936	0.6668	0.9801	0.7641	0.5582	0.3811	0.2388	0.1156	0.7441
i	0.0356	3.2757	0.0212	0.1474	0.2993	0.4962	0.7350	0.9977	0.7053	0.4459	0.2363	0.0774	-0.0507	0.7204
k	0.0025	0.2280	-0.5347	-0.4814	-0.3849	-0.2338	-0.0170	0.2706	0.4685	0.5874	0.6436	0.6529	0.6249	0.9570
n	0.0024	0.2229	0.1641	0.2778	0.4072	0.5690	0.7551	0.9471	0.5963	0.3005	0.0713	-0.0929	-0.2149	0.7281
y/n	0.0086	0.7921	-0.0614	0.0683	0.2286	0.4395	0.7012	0.9959	0.7459	0.5151	0.3231	0.1727	0.0453	0.7309
r	0.0001	0.0072	0.4414	0.4994	0.5448	0.5833	0.6026	0.5846	0.1938	-0.1076	-0.3200	-0.4539	-0.5330	0.8481
w	0.0014	0.1323	-0.4413	-0.4997	-0.5451	-0.5835	-0.6028	-0.5846	-0.1934	0.1084	0.3208	0.4548	0.5342	0.8480
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0100	1.0000	-0.0136	0.1150	0.2710	0.4739	0.7234	1.0000	0.7234	0.4739	0.2710	0.1150	-0.0136	0.7231
c	0.0022	0.2204	-0.1808	-0.0520	0.1138	0.3372	0.6219	0.9525	0.7755	0.5967	0.4386	0.3062	0.1852	0.7632
i	0.0351	3.5204	0.0210	0.1474	0.2991	0.4958	0.7346	0.9972	0.7040	0.4439	0.2343	0.0753	-0.0531	0.7198
k	0.0024	0.2447	-0.5336	-0.4802	-0.3836	-0.2323	-0.0153	0.2726	0.4705	0.5889	0.6447	0.6533	0.6245	0.9569
n	0.0012	0.1239	0.3848	0.4613	0.5291	0.5974	0.6591	0.6911	0.2955	-0.0169	-0.2397	-0.3856	-0.4805	0.8136
y/n	0.0091	0.9188	-0.0667	0.0631	0.2236	0.4353	0.6985	0.9952	0.7475	0.5182	0.3273	0.1773	0.0500	0.7314
r	0.0001	0.0067	0.5277	0.5427	0.5289	0.4849	0.3998	0.2577	-0.0876	-0.3388	-0.5021	-0.5934	-0.6332	0.9266
w	0.0012	0.1244	-0.5276	-0.5430	-0.5293	-0.4853	-0.4004	-0.2582	0.0875	0.3392	0.5027	0.5941	0.6341	0.9263
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0102	1.0000	-0.0132	0.1153	0.2712	0.4742	0.7235	1.0000	0.7235	0.4742	0.2712	0.1153	-0.0132	0.7232
c	0.0025	0.2484	-0.1553	-0.0263	0.1389	0.3607	0.6415	0.9657	0.7723	0.5819	0.4158	0.2791	0.1568	0.7548
i	0.0351	3.4388	0.0210	0.1474	0.2991	0.4959	0.7347	0.9973	0.7044	0.4445	0.2349	0.0760	-0.0524	0.7200
k	0.0024	0.2391	-0.5340	-0.4806	-0.3840	-0.2328	-0.0158	0.2720	0.4699	0.5885	0.6444	0.6532	0.6246	0.9569
n	0.0015	0.1460	0.3009	0.3962	0.4928	0.6034	0.7210	0.8231	0.4344	0.1192	-0.1131	-0.2715	-0.3813	0.7693
y/n	0.0090	0.8837	-0.0647	0.0651	0.2256	0.4370	0.6996	0.9956	0.7469	0.5169	0.3257	0.1754	0.0481	0.7312
r	0.0001	0.0067	0.5094	0.5376	0.5413	0.5211	0.4660	0.3588	-0.0050	-0.2749	-0.4552	-0.5604	-0.6126	0.9068
w	0.0013	0.1241	-0.5092	-0.5378	-0.5415	-0.5214	-0.4664	-0.3591	0.0051	0.2754	0.4557	0.5611	0.6135	0.9065
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF
y	0.0100	1.0000	-0.0136	0.1150	0.2710	0.4739	0.7234	1.0000	0.7234	0.4739	0.2710	0.1150	-0.0136	0.7231
c	0.0022	0.2204	-0.1808	-0.0520	0.1138	0.3372	0.6219	0.9525	0.7755	0.5967	0.4386	0.3062	0.1852	0.7632
i	0.0351	3.5204	0.0210	0.1474	0.2991	0.4958	0.7346	0.9972	0.7040	0.4439	0.2343	0.0753	-0.0531	0.7198
k	0.0024	0.2447	-0.5336	-0.4802	-0.3836	-0.2323	-0.0153	0.2726	0.4705	0.5889	0.6447	0.6533	0.6245	0.9569
n	0.0012	0.1239	0.3848	0.4613	0.5291	0.5974	0.6591	0.6911	0.2955	-0.0169	-0.2397	-0.3856	-0.4805	0.8136
y/n	0.0091	0.9188	-0.0667	0.0631	0.2236	0.4353	0.6985	0.9952	0.7475	0.5182	0.3273	0.1773	0.0500	0.7314
r	0.0001	0.0067	0.5277	0.5427	0.5289	0.4849	0.3998	0.2577	-0.0876	-0.3388	-0.5021	-0.5934	-0.6332	0.9266
w	0.0012	0.1244	-0.5276	-0.5430	-0.5293	-0.4853	-0.4004	-0.2582	0.0875	0.3392	0.5027	0.5941	0.6341	0.9263
	St. D.	Rel St. D.	x(-5)	x(-4	x(-3)	x(-2)	x(-1)	x(0)	x(+1)	x(+2)	x(+3)	x(+4)	x(+5)	ACF

y	0.0098	1.0000	-0.0140	0.1148	0.2707	0.4737	0.7232	1.0000	0.7232	0.4737	0.2707	0.1148	-0.0140	0.7230
c	0.0019	0.1933	-0.2126	-0.0847	0.0812	0.3060	0.5947	0.9322	0.7768	0.6137	0.4664	0.3400	0.2213	0.7750
i	0.0352	3.6022	0.0212	0.1475	0.2991	0.4957	0.7345	0.9970	0.7035	0.4433	0.2336	0.0746	-0.0537	0.7196
k	0.0024	0.2503	-0.5333	-0.4798	-0.3832	-0.2318	-0.0147	0.2732	0.4710	0.5894	0.6449	0.6533	0.6244	0.9569
n	0.0011	0.1118	0.4602	0.5116	0.5437	0.5612	0.5571	0.5090	0.1252	-0.1684	-0.3695	-0.4942	-0.5675	0.8678
y/n	0.0093	0.9480	-0.0690	0.0608	0.2215	0.4335	0.6972	0.9948	0.7482	0.5196	0.3293	0.1795	0.0523	0.7318
r	0.0001	0.0068	0.5384	0.5422	0.5140	0.4506	0.3414	0.1715	-0.1553	-0.3888	-0.5368	-0.6156	-0.6446	0.9402
w	0.0012	0.1264	-0.5385	-0.5426	-0.5146	-0.4512	-0.3421	-0.1722	0.1552	0.3893	0.5375	0.6164	0.6456	0.9399

Conclusions

This paper explores the implications of endogenizing the coefficient of relative risk aversion within a standard real business cycle (*RBC*) model. By formulating the risk aversion coefficient as a first-order linear approximation of a non-linear cyclical function of output, this paper provides novel insights into how cyclical risk aversion affects the dynamics of key macroeconomic variables.

This analysis demonstrates that endogenous risk aversion significantly impacts model predictions across various parametrizations. I consistently find that procyclical risk aversion (lower γ values) corresponds to higher output volatility, suggesting that when economic agents become less risk-averse during expansions and more risk-averse during contractions, it amplifies the economy's response to shocks.

Labor market dynamics prove particularly sensitive to risk aversion cyclicality. In both baseline and linear disutility models, labor volatility and its correlation with output increase as risk aversion becomes more procyclical. This could help explain observed labor market fluctuations that standard *RBC* models struggle to capture.

Furthermore, procyclical risk aversion tends to increase consumption volatility and strengthen its lagged correlations with output, aligning better with empirical observations. Importantly, it helps mitigate common discrepancies between *RBC* model predictions and empirical data, such as overshooting investment volatility and undershooting factor price volatility.

The high risk aversion scenario demonstrates that while risk aversion cyclicality continues to influence business cycle dynamics, the overall risk aversion level can moderate these effects, underscoring the complex interplay between risk aversion's level and cyclicality in shaping macroeconomic outcomes.

This paper makes a valuable contribution by being the first to systematically investigate how endogenous risk aversion affects the business cycle properties of the *RBC* model. The findings suggest that incorporating time-varying, cyclical risk aversion into macroeconomic models could substantially improve their explanatory power.

For future research, rigorous estimation of the risk aversion coefficient and its cyclical properties is crucial. Extensions to more complex models incorporating nominal rigidities, financial frictions, or heterogeneous agents could provide richer insights. Additionally, exploring the implications of cyclical risk aversion for policy design and welfare analysis represents a promising avenue for investigation (Ateşağaoğlu and Torul 2018).

In conclusion, by demonstrating the potential significance of endogenous, cyclical risk aversion for business cycle dynamics, this paper aims to enhance our understanding of macroeconomic fluctuations and paves the way for research that could further bridge the gap between theoretical models and empirical observations.

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Appendix

Appendix Tables and Figures

Figure A. 1: Simulations of the Risk Aversion Coefficient

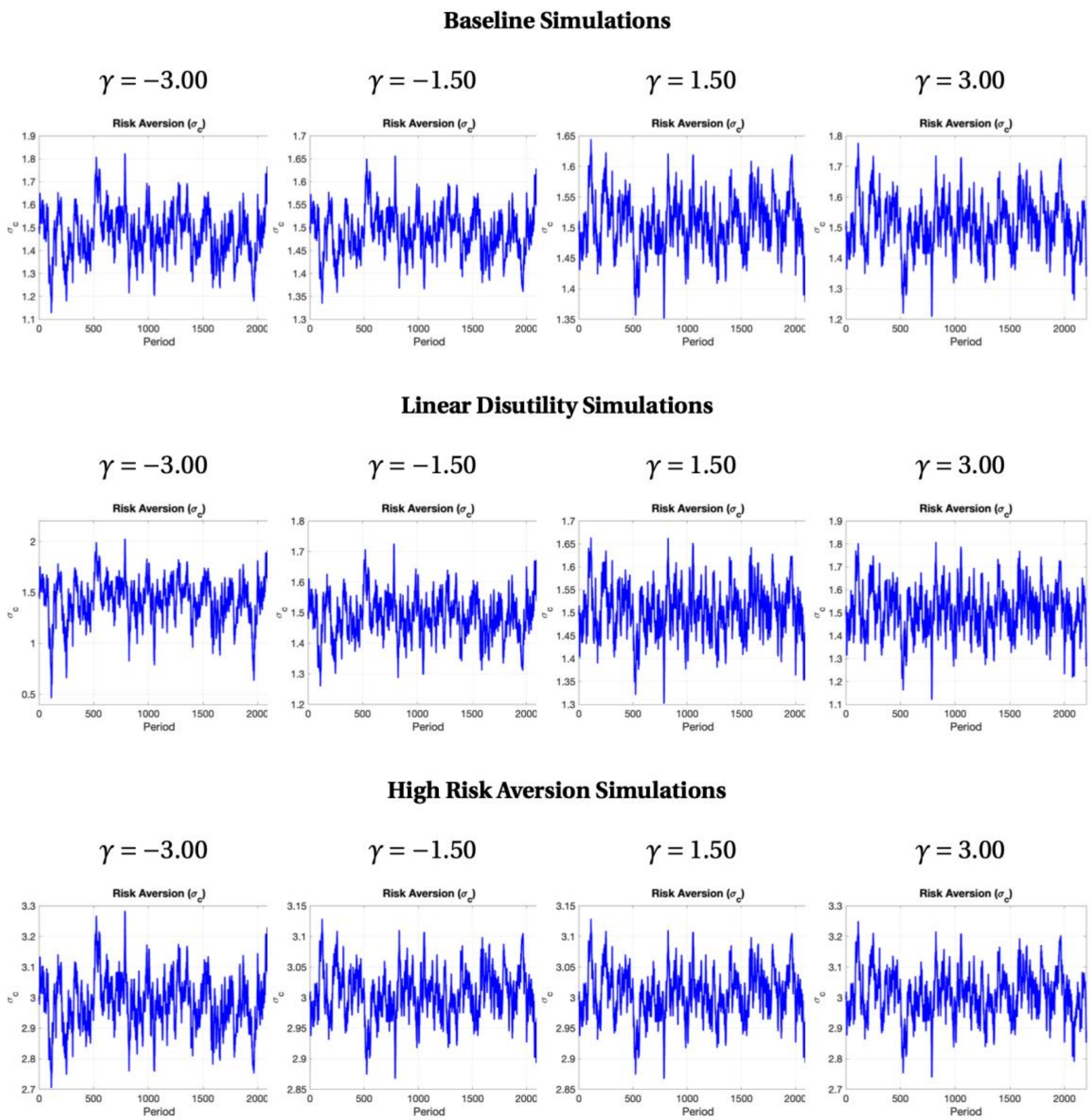

Table A. 1: Business Cycle Statistics for the U.S. Economy

	y	*c*	*n*	*y*/*n*	*I*	*w*	*r*	*z*
Std. D (%)	1.81	1.35	1.79	1.02	5.30	0.68	0.30	0.54
Relative Std. D.	1.00	0.74	0.99	0.56	2.93	0.38	0.16	0.52
Corr(*y*)	1.00	0.88	0.88	0.55	0.80	0.12	-0.35	0.78
Autocorrelation	0.84	0.80	0.88	0.74	0.87	0.66	0.60	0.74

Biography

Orhan Torul is an associate professor at the *Department of Economics* and a research associate at the *Center for Economics and Econometrics* at *Boğaziçi University*. He received his PhD in Economics from the *University of Maryland, College Park* in 2013. He worked as a visiting researcher at the *Istanbul School of Central Banking* in 2015, the *Department of Economics* at the *University of Oslo* in 2017, and *the Center for the Economics in Human Development* at the *University of Chicago* in 2021 and 2022. His research interests lie in the areas of macroeconomics, economic inequality, and political economy.