

DISCUSSION PAPERS IN ECONOMICS

Working Paper No. 04-07

The Spirit of Capitalism, Asset Returns,
and the Business Cycle

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May 2004

Abstract

We evaluate whether the spirit of capitalism improves the ability of real business cycle (RBC) models to explain the main features of both asset returns and business cycles. In our model, the spirit of capitalism is embodied in the assumption that individuals have direct preferences for financial wealth. Our simulation results suggest that this assumption improves the RBC model's ability to explain the features of asset returns. This assumption, however, markedly deteriorates the model's ability to account for the features of the business cycle.

Equity premium; Direct preferences for financial wealth; $\tau = 0.64$; $\tau_D = 0$; $\tau_D = 0.06$; $\tau_c = 0$; $\tau_j = 0.3$

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in Boldrin, Christiano, and Fisher (2001). Although we are interested in asset prices, the allocation for these economies can be found as the solution to a planner's problem. This allocation is then used to uncover the required asset prices.

The planner chooses consumption, employment, and investment to maximize consumers' expected lifetime utility

$$E_0 \sum_{t=0}^{\infty} \beta^t u(c_t | \tilde{A} c_{t-1}) - \mu n_t ; \quad (2:1)$$

subject to

$$y_t = c_t + x_t; \quad (2:2)$$

$$y_t = z_t k_t^\alpha n_t^{1-\alpha}; \quad (2:3)$$

$$k_{t+1} = \delta \frac{x_t}{k_t} k_t + (1 - \delta) k_t; \quad (2:4)$$

$$\ln(z_t) = (1 - \lambda) \ln(\bar{z}) + \lambda \ln(z_{t-1}) + \varepsilon_t; \quad (2:5)$$

where E_t is the conditional expectation operator, c_t is consumption, n_t is employment, x_t is investment, y_t is output, k_t is the stock of capital, and z_t is the stochastic level of total factor productivity. The parameter $0 < \beta < 1$ is the consumer's subjective discount factor, $\tilde{A} \geq 0$ is the measure of habit formation, $\mu > 0$ is the measure of disutility from working, $0 < \alpha < 1$ is the share of capital, $0 < \delta < 1$ is the rate of depreciation, and $0 < \lambda < 1$ is the persistence of total factor productivity. Finally, ε_t is an independently and identically distributed normal random variable with mean 0 and variance σ^2 .

shock. In the Habit model, however, employment is chosen before r

The constraints (2.2)-(2.5) and the conditions (2.6)-(2.8) can be used to uncover the economy's allocation. This allocation can then be used to uncover asset prices. For asset prices, we follow Boldrin, Christiano, and Fisher (2001), and assume that investment is fully equity financed and define the risky return as the return on capital:

$$R_{t+1}^k = \frac{y_{t+1}}{k_{t+1}} + p_{0;t+1}^k - p_{1;t}^k \quad (2:9)$$

where

$$p_{0;t+1}^k = \frac{1}{1+i} \left[\frac{x_{t+1}}{k_{t+1}} + \frac{1}{1+i} \left(\frac{x_{t+1}}{k_{t+1}} + (1-i) \right) \right] \quad (2:10)$$

$$p_{1;t}^k = \frac{1}{1+i} \quad (2:11)$$

The price

d6 TD /F5 12 Tf 10 012 Tf 5 Tc (x) Tj 6 8 1 0 Tf 0 Tc 5 036 Tf 0 T12 Tf 4 Tc (1) Tj ET 365.0

The data statistics come from two sour

effects on the financial statistics, and mainly results in further consumption smoothing (see Table 2).

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it slightly underpredicts the volatility of consumption and employment. Furthermore, as argued in Cogley and Nason (1995), the large predicted persistence of consumption and output are generated by the exogenous persistence of total factor productivity. Figure 1 shows the dynamic responses of output, consumption, employment, capital, and technology to a one percentage point increase in the technology shock.

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replicates the business cycle statistics. Interestingly, the failures to replicate the financial statistics appears independent of the value of the coefficient of relative risk aversion. In contrast, the Habit formation model replicates the financial statistics, but fails to replicate the business cycle statistics.

3. Production Economies with Spirit-of-Capitalism

The Spirit of Capitalism model retains the production structure of the Habit formation model, but replaces the habit formation preferences by direct preferences for financial wealth. In doing so, our benchmark model is the absolute wealth is status framework of Bakshi and Chen (1996). For this model, we create a decentralized version that retains some features of the Habit model.

The decentralized equilibrium is solved as follows. Consumers choose consumption, employment, and asset holdings to maximize

$$E_0 \sum_{t=0}^{\infty} \beta^t u(c_t; s_t) \quad (3:1)$$

subject to

$$c_t + p_t a_{t+1} + q_t b_{t+1} = w_t n_t + (p_t + d_t) a_t + b_t; \quad (3:2)$$

where s_t is the index of status, w_t is the wage rate, a_t and p_t are the quantity and price of the risky asset, d_t is dividends paid by the risky asset, and b_t and q_t are the quantity and price of the risk-free asset. The objective function (3.1) shows expected lifetime utility and the constraint (3.2) is the consumer's period budget.

As before, the period utility is linear in employment, and we only consider the case where employment is chosen before realization of the technology shock. The functional form for the subutility function $u(c; s)$ follows Bakshi and Chen (1998):

$$u(c_t; s_t) = c_t^{1-\sigma} s_t^{\phi} = (1-\sigma)\phi;$$

The economy is closed by the following market clearing conditions. The asset market clearing conditions are

$$a_t = 1: \tag{3:18}$$

$$b_t = 0: \tag{3:19}$$

The goods market clearing condition is

$$y_t = c_t + x_t: \tag{3:20}$$

The budget constraints (3.2) and conditions (3.4)-(3.6), the firm's constraints (3.12)-(3.14) and conditions (3.15)-(3.17), the definition of status (3.3), and market clearing conditions (3.18)-(3.20) are used to compute the economy's allocation. This allocation is then used to compute asset prices. As before, we define the risky return as the return on capital:

$$R_{t+1}^k = \frac{y_{t+1} - k_{t+1}}{k_t} + p_{0;t+1}^k = p_{1;t}^k; \tag{3:21}$$

where

$$p_{0;t+1}^k = 1 + \frac{x_{t+1}}{k_{t+1}} \quad i \quad \frac{x_{t+1}}{k_{t+1}}$$

where $s_t = \ln(c_{t+1})$. We approximate the expectation in terms (3.24) as

$$E_t \exp(c_{t+1}) = \exp \left[E_t s_{t+1} + \frac{1}{2} E_t \text{Var}[s_{t+1}] \right] \quad (3:25)$$

As in the previous models, we set $\beta = 0.36$, $\alpha = 0.021$, $\gamma = 0.23$, $\lambda = 0.979$, and $\mu = 0.0072$. We set μ to ensure that employment $n = 1$ in the steady state, and set β_1 and β_2 to ensure that $\hat{A}(\pm) = \pm$ and $\hat{A}^0(\pm) = 1$. Bakshi and Chen (1996) provide estimates of σ and ρ for $\tau = 1$. The unrestricted estimates of σ vary between 2.27 and 3.08, while those of ρ vary between 0.75 and 1.27. As a benchmark, we retain $\tau = 0.99999$ and $\sigma = 2$, and set $\rho = 1.27$.

The simulation results are presented in Tables 1 and 2. The simulated statistics for the Spirit of Capitalism model are computed as before.

First, the benchmark Spirit of Capitalism model fails to replicate the financial statistics. The model predicts a negative risk-free rate. Note that, far from a failure, the underprediction of the risk-free rate can be interpreted as the ability to resolve the risk-free rate $r^e < r^p$.

employment. Finally, it also incorrect

the capital stock.

To see this, the third experiment removes the investment adjustment costs (i.e. we let $\beta = 1$, $\beta_1 = 1$, and $\beta_2 = 0$). The results of this experiment appear as "High" in the tables. Eliminating the adjustment cost makes the predictions of the Spirit of Capitalism model closer to those of the standard RBC model. It corrects the anomalous volatility of both consumption, raises the volatility of investment, and corrects other anomalous business cycle statistics. Unfortunately, it also eliminates the equity premium and seriously reduces the volatility of both risk-free and risky rates.

The fourth experiment simply lowers the extent to which consumers care about status. Note that this also lowers the effective degree of risk aversion. For this experiment, we set $\gamma = 0.75$ | the lower estimate in Bakshi and Chen (1998). The results appear as "Low" in the tables. As expected, lowering the extent to which consumers care about status reduces the volatility of both the risk-free and risky rates, and also lowers the equity premium. In addition, it reduces the volatility of consumption, but not sufficiently. Otherwise, it has little effects on the business cycle statistics.

The final experiment studies the anomalous behavior of employment and its effect on the autocorrelation of output. As in the Habit model, we implement a case where consumers supply labor inelastically. To do so, we set $\mu = 0$ and impose that $n_t = 1$. This experiment appears under "Inelastic Labor" in the tables. Making labor inelastic has only a small effect on the financial statistics. Obviously, it imposes a zero volatility of employment and a zero correlation with output. It corrects the anomalous negative autocorrelations of consumption and output, but still produces a large volatility of consumption and a small volatility of investment.

Overall, these results indicate that the absolute wealth is status framework of the Spirit of Capitalism model may solve the risk-free rate puzzle and considerably p

statistics.

4. Conclusion

In this paper, we evaluate whether the spirit of capitalism improves the ability of standard RBC models to exp

Appendix A

In this appendix, we show that $R_{t+1}^e = R_{t+1}^k$ in all models considered.

First, we define the firm's dividends as $d_t = y_t - w_t n_t - x_t = (1 - \delta) y_t - x_t$, since $w_t n_t = (1 - \delta) y_t$. Second, we apply a forward substitution on the equity price $p_t = E_t (p_{t+1} + d_{t+1}) = R_{t+1}^e$ to obtain

$$p_t = E_t \left[\frac{1}{R_{t+1}^e} d_{t+1} + \frac{1}{R_{t+1}^e} \frac{1}{R_{t+2}^e} d_{t+2} + \frac{1}{R_{t+1}^e} \frac{1}{R_{t+2}^e} \frac{1}{R_{t+3}^e} d_{t+3} + \dots \right] \quad (\text{A:1})$$

Third, we rewrite the firm's first-order condition for investment

$$1_t = E_t \left[\frac{1}{R_{t+1}^e} \frac{y_{t+1}}{k_{t+1}} + 1_{t+1} \frac{A_{t+1}}{A_t} \frac{A_{t+1}^0}{A_t^0} \frac{x_{t+1}}{k_{t+1}} + (1 - \delta) \right] \quad (\text{A:2})$$

as

$$E_t \left[\frac{1}{R_{t+1}^e} \frac{y_{t+1}}{k_{t+1}} + 1_{t+1} \frac{A_{t+1}}{A_t} \frac{A_{t+1}^0}{A_t^0} \frac{x_{t+1}}{k_{t+1}} + (1 - \delta) \right] = 1_t \frac{A_{t+1}}{A_t} \frac{A_{t+1}^0}{A_t^0} \frac{x_{t+1}}{k_{t+1}} + (1 - \delta) \quad (\text{A:3})$$

where $1_t = 1 - \delta$

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mimeo Peking University.

Zou, H. (1995) The spirit of capital $T\bar{d}(p)$ Tj 6.6 0 TD 8 0 TD 0.06 Tc (n) 9(4 Tc (t) Tj 4.68 0D (.)

Table 1. Financial Statistics

	Averages		Volatility		Ratio
	$E(r^f)$	$E(r^k - r^f)$	σ_{r^f}	σ_{r^k}	$E(r^k - r^f) / \sigma_{r^k}$
Data	1.19	6.63	5.27	19.40	0.34
RBC Model					
Benchmark	4.10	0.01	0.32	0.34	0.04
High ϕ	4.09	0.02	0.26	0.27	0.07
Habit Model					
Benchmark	2.75	7.10	30.05	49.82	0.14
Inelastic Labor	-0.87	5.63	7.96	32.74	0.17
Spirit of Capitalism Model					
Benchmark	-3.97	0.38	5.09	10.15	0.04
Low η	1.19	0.11	2.67	5.69	0.02
High ϕ	-0.45	1.59	14.34	23.60	0.07
High η	-4.11	-0.01	0.12	0.13	-0.02
Low η	-3.45	0.33	4.54	9.44	0.04
Inelastic Labor	-3.99	0.29	5.26	9.21	0.03

Note: Entries under Averages, Volatility, and Ratio refer to the unconditional mean of a variable, the standard deviation of a variable, and the ratio of the unconditional mean of a variable to a standard deviation of a variable. The variables are the annualized percentage risk-free rate r^f , the annualized percentage risky rate r^k , as well as the difference between the two. The Data statistics are taken from Boldrin, Christiano, and Fisher (2001). The Model statistics are computed as the averages over 1000 repetitions of 200 periods.

Table 2. Business Cycle Statistics

	Volatility			Correlation			Persistence	
	$\frac{3}{4}c = \frac{3}{4}y$	$\frac{3}{4}x = \frac{3}{4}y$	$\frac{3}{4}n = \frac{3}{4}y$	$\frac{1}{2}(c; y)$	$\frac{1}{2}(x; y)$	$\frac{1}{2}(n; y)$	$\frac{1}{2}(c^0; c)$	$\frac{1}{2}(y^0; y)$
Data	0.80	2.61	0.99	0.96	0.94	0.80	0.86	0.89
RBC Model								
Benchmark	0.33	3.13	0.40	0.97	0.99	0.91	0.73	0.70
High °	0.14	3.68	0.50	0.98	0.99	-0.78	0.72	0.70
Habit Model								
Benchmark	0.30	2.69	1.74	0.26	0.98	0.03	0.91	-0.04
Inelastic Labor	0.64	2.13	0.00	0.71	0.93	0.00	0.93	0.71
Spirit of Capitalism Model								
Benchmark	2.22	0.69	1.95	0.9				

Fig 1:
RBC Model

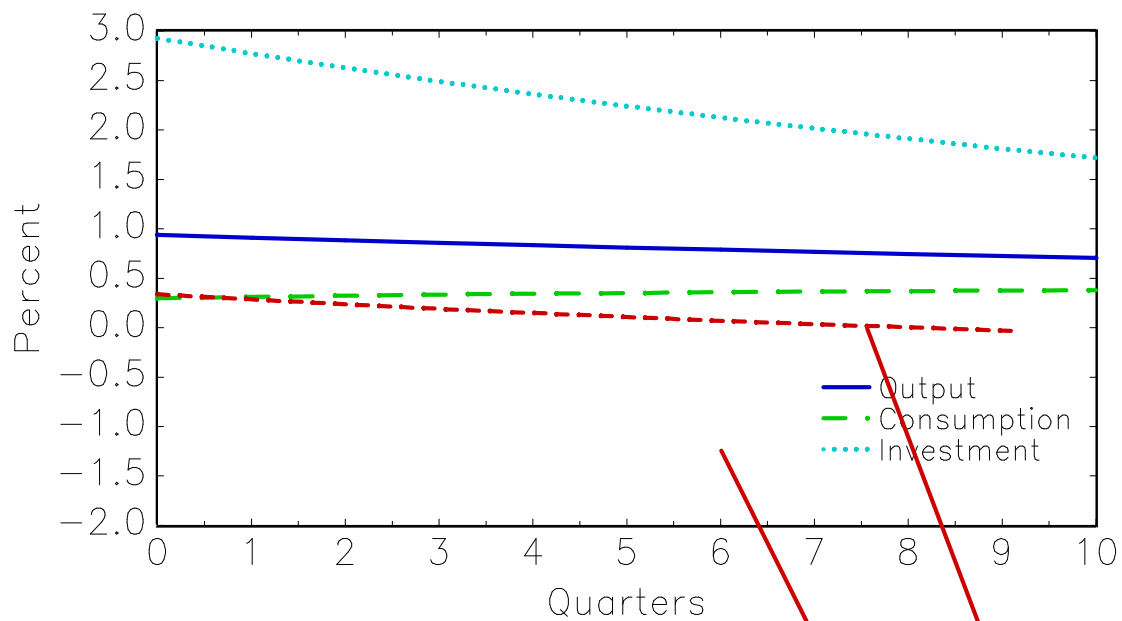


Fig 2:
Habit Model

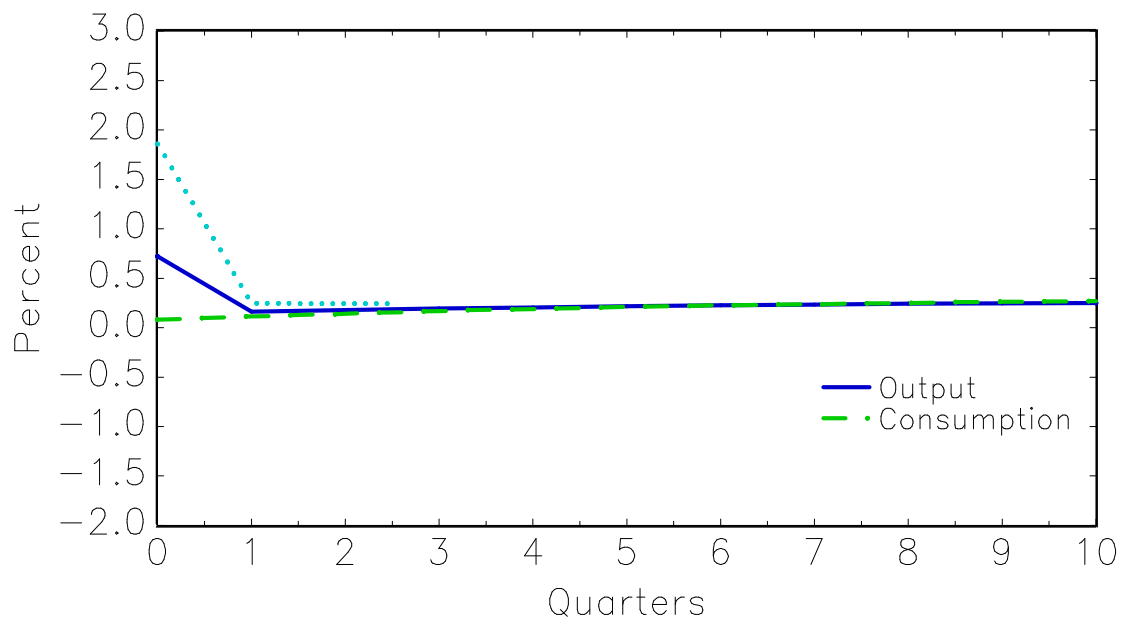


Fig 3:
Spirit of Capitalism Model

