Economics Bulletin

Volume 31, Issue 2

Testing the "Catching up with the Joneses" Model with Consumption Externality in Japan

Akihiko Noda
Faculty of Economics, Toyo University

Abstract

The purpose of this paper is to test Abel's (1990, 1999) "Catching up with the Joneses" model with a consumption externality using Japanese financial data. It is found that the model is rejected in Japan when it is estimated using generalized empirical likelihood (GEL) estimators.

I would like to thank Mikio Ito, Colin McKenzie, Taisuke Otsu, Makoto Yano and an anonymous referee for their helpful comments and suggestions.
Citation: Akihiko Noda, (2011) ''Testing the "Catching up with the Joneses" Model with Consumption Externality in Japan'', *Economics Bulletin*, Vol. 31 no.2 pp. 1648-1658.
Submitted: May 10 2011. **Published:** June 06, 2011.

1 Introduction

Mehra and Prescott (1985) point to a puzzle, namely, the inability of standard intertemporal economic models such as the consumption-based capital asset piricing model (CCAPM) to rationalize the statistics that have characterized U.S. financial markets over the past century. They show that the models fail to explain the difference between the average returns of risky and safe assets in U.S. financial markets. This puzzle, called the equity premium puzzle, comes from an equation concerning the intertemporal rational behavior of participants in financial markets. We can easily verify the puzzle using several statistics calculated from financial data and estimates of the discount factor and the degree of risk aversion. Inspired by the equity premium puzzle, Weil (1989) points to another puzzle, namely the risk-free rate puzzle. In turn, economists confront the inability of the models to explain the average return of the safe asset. The puzzles are still puzzles for U.S. and other industrialized countries, including Japan (see Kocherlakota (1996) and Mehra and Prescott (2003) for details).

In order to resolve the discrepancy between the CCAPM's predictions and empirical data, a number of economist have modified CCAPM theoretically by introducing additional settings (see also Noda (2011) for details). One of these modifications is a habit formation approach. We can classify research on the habit formation approach into two groups depending on the effect of an investor's own decisions on the future levels of habit. Constantinides (1990) and Sundaresan (1989) propose an *internal* habit model in which the habit level depends on the investor's own past consumption, and the investor takes this into account while making decisions about his/her current consumption choice. Abel (1990, 1999), Gali (1994) and Campbell and Cochrane (1999) propose an *external* habit model in which the habit level depends on past aggregate consumption and is not determined by any one investor's decision. Campbell (2003) insists on the importance of habit formation to resolve the puzzles. For instance, Campbell and Cochrane (1999) report that using the habit formation approach, they are able to partially resolve the puzzles in the U.S. stock market.

There are, however, only a few studies about whether habit formation resolves the puzzles in Japan. In particular, there is little consensus regarding whether Abel's (1990, 1999) or Gali's (1994) model, which consider a consumption externality in the standard CCAPM, performs well empirically. Ikeda and Tsutsui (1996) estimate the parameters of Gali's (1994) model using consumption data by income quantile, and conclude that a consumption externality is corroborated in high income quantiles. Bakshi and Naka (1997) and Baba (2000) evaluate the validity of the Abel's (1990, 1999) model, and report that the model is rejected when tested using the volatility bounds test of Hansen and Jagannathan (1991) and the specification error test of Hansen and Jagannathan (1997). However, Hansen and Jagannathan's (1991, 1997) tests have problems in small samples because those tests are based on generalized method of moments (GMM) estimates (see also Cochrane and Hansen (1992), Burnside (1994), Balduzzi and Kallal (1997) and Ahn and Gadarowski (2004)).

While we pay attention to empirical methods, few economists have been concerned about using alternative methods to estimate the parameters of the underlying asset pricing models. Since Hansen and Singleton (1982), GMM has been used to estimate the parameters of CCAPMs. When we apply GMM to estimate the parameters of CCAPMs, two important drawbacks have been reported: (i) the problem of weak identification and (ii) the problem of many moment conditions. We can understand both problems in the context of the small sample properties of the GMM estimator; the GMM estimator has a non-negligible small sample bias when we fail to choose appropriate instruments, and use of too many moment conditions allow us to fail to extract information from the available data (see also Stock et al. (2002) for details).

In an effort to improve on the poor performance of GMM in small samples, a number of alternative estimators have been suggested. The class of generalized empirical likelihood (GEL) estimators is attracting the attention of many econometricians because of their better small sample performance compared to the GMM estimator. The class of GEL estimators have the same asymptotic distributions as GMM, but Newey and Smith (2004) demonstrate the theoretical advantage of GEL estimators by comparing the higher order asymptotic biases of the GEL and GMM estimators. Some other economists have also reported the advantage of GEL-based estimators. For instance, when Ito and Noda (2010) employ the standard CCAPM and use Japanese data, they report that the GEL estimates are incomparably better than the Two-step GMM (2S-GMM) estimator in terms of the higher order mean squared error of Donald and Newey (2001). Following them, instead of the 2S-GMM estimator, this paper employs the GEL estimator to estimate the parameters of the Abel's (1990, 1999) model. The main results of this paper are: (i) Abel's (1990, 1999) model is rejected when estimated using Japanese financial data, (ii) the returns in the Japanese stock market can be explained by the standard CCAPM with power utility, and (iii) the GEL estimates are stable regardless of the model specification, but the GMM estimates are not.

The rest of the paper is organized as follows. Section 2 presents a review of Abel's (1990, 1999) "Catching up with the Joneses" model with a consumption externality and the GEL estimator. Section 3 provides details of the data used, while section 4 presents the empirical results. Section 5 contains some brief concluding remarks.

2 Model and Empirical Method

In this section, Abel's (1990, 1999) "Catching up with the Joneses" model with a consumption externality is presented together with details of the empirical methods used to estimate the parameters of the model.

2.1 "Catching up with the Joneses" Models

Abel (1990) incorporates a consumption externality into the standard CCAPM with power utility. Following Abel (1990, 1999), we assume that a representative investor at time t chooses his/her life-time consumption and holdings of several assets in order to maximize his/her expected life time utility subject to the budget constraint. The maximization problem is given by

$$\text{Max} \quad E_t \sum_{j=0}^{\infty} \beta^j u(c_{t+j}, v_{t+j}), \quad 0 < \beta < 1, \tag{1}$$

$$\text{s.t. } c_t + \sum_{i=1}^{N} p_{i,t} A_{i,t} = \sum_{i=1}^{N} [p_{i,t} + d_{i,t}] A_{i,t-1} + Y_t, \quad i = 1, 2, \cdots, N, \tag{2}$$

where the subscript t indicates time, c_t is investor's own real consumption, v_t is the benchmark level of consumption, $p_{i,t}$ is the price of the ith asset, $d_{i,t}$ is the dividend on the ith asset, $A_{i,t}$ is the amount of the holdings of the ith asset, Y_t is real labor income, N is the number of assets, β is the subjective time discount factor, and $E_t[\cdot]$ is the expectation operator conditional on the information available at time t.

Let us define the period utility function $u(\cdot)$ with v_t as

$$u(c_t, v_t) := \frac{(c_t/v_t)^{1-\gamma}}{1-\gamma}, \quad \gamma > 0, \tag{3}$$

$$v_t := \left[c_{t-1}^{D} C_{t-1}^{1-D}\right]^{\kappa}, \quad \kappa \geq 0, \quad D \geq 0, \tag{4}$$

where γ is the degree of relative risk aversion, κ is the degree of time non-separability and C_{t-1} is the per capita aggregate consumption level at time $t-1$. Here if we specify; (i) $D = 0$ and $\kappa \geq 0$, then the benchmark level of consumption, v_t, depends only on the lagged level of aggregate consumption per capita; and (ii) $D = 1$ and $\kappa \geq 0$, then the benchmark level of consumption, v_t, depends only on the investor's own past consumption. These respective specifications are, (i) the relative consumption model; and (ii) the *internal* habit model of Constantinides (1990) and Sundaresan (1989). The benchmark level of consumption can be specified to generate an *internal* or an *external* habit. Since there is a representative investor, in equilibrium; aggregate consumption equals the investor's own consumption ($c_{t-1} = C_{t-1}$), that is,

$$v_t = C_{t-1}^{\kappa}. \tag{5}$$

This is *internal* habit formation which is similar to Bakshi and Naka (1997) and Baba (2000). Therefore, we assume that the habit is completely endogenous to the investor.

Solving the above utility maximization problem, we can derive the following Euler equations:

$$E_t\left[\beta\left(\frac{C_{t+1}}{C_t}\right)^{-\gamma}\left(\frac{C_t}{C_{t-1}}\right)^{\kappa(\gamma-1)}(1+r_{i,t+1}) - 1\right] = 0, \quad i = 1, 2, \cdots, N, \tag{6}$$

where $r_{i,t+1}$ is the real return of the ith asset at time $t+1$, which is defined as

$$r_{i,t+1} = \frac{p_{i,t+1} + d_{i,t+1}}{p_{i,t}} - 1, \quad i = 1, 2, \cdots, N. \tag{7}$$

When $\kappa = 0$, the Euler equation (6) reduces to the case of standard CCAPM with power utility

$$E_t\left[\beta\left(\frac{C_{t+1}}{C_t}\right)^{-\gamma}(1+r_{i,t+1}) - 1\right] = 0, \quad i = 1, 2, \cdots, N. \tag{8}$$

At this stage, we do not assume any data generating process for C_t and $r_{i,t}$. Later in this section, we will show how to estimate the parameters in this Euler equation using the conditional expectation operator and how to conduct statistical inference using estimates of these parameters.

2.2 Moment Restriction Model

I present a framework, called the moment restriction model, that allows us to cope generally with statistical models where the distribution of the data is not specified. Many elaborate estimators, such as Newey and Smith's (2004) GEL estimator can be discussed in terms of the moment restriction model. In particular, we transform equation (6) or (8) into one without a conditional expectation operator in order to estimate the unknown parameters.

Define an $N \times 1$ error vector $\mathbf{u}_{t+1}(\theta_{ABEL})$ and $\mathbf{u}_{t+1}(\theta_{CCAPM})$ as

$$\mathbf{u}_{t+1}(\theta_{ABEL}) = \left[\beta \left(\frac{C_{t+1}}{C_t}\right)^{-\gamma} \left(\frac{C_t}{C_{t-1}}\right)^{\kappa(\gamma-1)} (\mathbf{1} + \mathbf{r}_{t+1})\right] - \mathbf{1}, \tag{9}$$

or

$$\mathbf{u}_{t+1}(\theta_{CCAPM}) = \left[\beta \left(\frac{C_{t+1}}{C_t}\right)^{-\gamma} (\mathbf{1} + \mathbf{r}_{t+1})\right] - \mathbf{1}, \tag{10}$$

where $\mathbf{r}_{t+1} = (r_{1,t+1}, r_{2,t+1}, \cdots, r_{N,t+1})'$, $\mathbf{1} = (1, 1, \cdots, 1)'$, $\theta_{ABEL} = (\beta, \gamma, \kappa)'$ and $\theta_{CCAPM} = (\beta, \gamma)'$. Let $\mathbf{z}_t$ be an K vector of instruments known at time t, and define an $NK \times 1$ vector $g_t(\theta)$ as

$$g_t(\theta) = \mathbf{u}_{t+1}(\theta) \otimes \mathbf{z}_t. \tag{11}$$

Then the Euler equation implies

$$E[g_t(\theta)] = \mathbf{0}, \tag{12}$$

where $E[\cdot]$ is the unconditional expectation operator. We call this equation a moment restriction model.

Generally, let $y_t, (t = 1, 2, \cdots, T)$, denote observations on a finite dimensional process, which are usually assumed to be stationary and strongly mixing (see Smith (2004)). The right-hand side of equation (11), $g_t(\theta)$, is called a moment indicator, which is a function with respect to the parameters concerned, but also depends on the data, y_t, and potentially on the instruments, $\mathbf{z}_t$. For economy of notation, we omit the dependence of g on y_t and $\mathbf{z}_t$.

In the next subsection, I present the GEL estimator used to estimate the parameters in moment restriction models.

2.3 GEL

It is widely known that the GMM estimator of Hansen (1982) has poor small sample properties. Many econometricians have tried to improve on the GMM estimator's small sample properties and have suggested several alternative estimators. These include the empirical likelihood (EL) estimator of Owen (1988), the continuous updating estimator (CUE) of Hansen et al. (1996), and the exponential tilting (ET) estimator of Kitamura and Stutzer (1997).

As shown by Newey and Smith (2004), all these estimators belong to the class of GEL estimators. Following Newey and Smith (2004), this subsection provides a brief review of the estimators of a moment restriction model. The model presented in subsection 2.2 is one with m moment restrictions. Before reviewing the estimators of the parameters in such a model, let us define some notation. $\mathbf{x}_t, (t = 1, 2, \cdots, T)$ denotes i.i.d. observations of the data, and p (equal to 3 or 2 in our model) denotes the number of parameters to be estimated. We sometimes write $g(\mathbf{x}, \theta)$ as an NK vector of functions of the data and the parameters. We assume that $m \geq p$ and that the model has a true parameter θ_0 satisfying the following condition:

$$E[g(\mathbf{x}, \theta_0)] = 0,$$

where E is the expectation taken with respect to the distribution of the x_t's. In order to explain the GEL estimator, let $g_t(\theta) = g(x_t, \theta)$, and $\rho(v)$ be a concave function on a real open interval $\mathcal{V}$ containing zero. The GEL estimator is defined as

$$\hat{\theta}_{GEL} = \arg\min_{\theta\in\Theta} \sup_{\lambda\in\hat{\Lambda}_t(\theta)} \sum_{t=1}^{T} \rho(\lambda' g_t(\theta)), \tag{13}$$

where Θ denotes the parameter space, and $\hat{\Lambda}_t(\theta) = \{\lambda : \lambda' g_t(\theta) \in \mathcal{V}\}$. Alternative estimators to the GMM estimator can be obtained by specifying $\rho(v)$. As Kitamura and Stutzer (1997) show, in the case of the EL estimator, $\rho(v) = \ln(1 - v)$, and in the case the ET estimator, $\rho(v) = -e^v$. Furthermore, when $\rho(v) = -(1 + v)^2/2$, the GEL estimator is equivalent to the CUE estimator,

$$\hat{\theta}_{CUE} = \arg\min_{\theta\in\Theta} \hat{g}(\theta)'\hat{\Omega}(\theta)^{-}\hat{g}(\theta), \tag{14}$$

where $\hat{\Omega}(\theta) = T^{-1}\sum_{t=1}^{T} g_t(\theta)g_t(\theta)'$ and A^{-} denotes any generalized inverse of the matrix A. (See Theorem 2.1 in Newey and Smith (2004)).

For convenience, we impose a normalization on $\rho(v)$ as follows. Let $\rho_j(v) = \partial^j\rho(v)/\partial v^j$ and $\rho_j = \rho_j(0)$ for each j. We assume that $\rho_1 = \rho_2 = -1$. Associated with each GEL estimator there are implied probabilities for the observed data. Since these probabilities are used in our empirical analysis, we briefly review them. Consider $\rho(v)$, an associated GEL estimator $\hat{\theta}$, and $\hat{g}_t = g_t(\hat{\theta})$. The implied probabilities are given by

$$\hat{\pi}_t = \frac{\rho_1(\hat{\lambda}'\hat{g}_t)}{\sum_{s=1}^{T}\rho_1(\hat{\lambda}'\hat{g}_s)}, \quad t = 1, 2, \cdots, T, \tag{15}$$

where $\hat{\lambda} = \arg\max_\lambda \sum_{t=1}^{T}\rho(\lambda'\hat{g}_t)/n$. For any function $f(x,\theta)$ and GEL estimator of θ, an efficient estimator of $E[f(x,\theta_0)]$, $\sum_{t=1}^{T}\hat{\pi}_t f(x_t,\hat{\theta})$, can be derived, as shown in Brown and Newey (1998).

Similar to the J-statistic in GMM estimation, we can use a J-statistic to test the overidentifying restrictions when a GEL estimator is employed. The J-statistic for using the GEL estimator is computed using the kernel-smoothed moment indicator (see Section 4 in Smith (2004) for details). Under the null hypothesis that equation (12) is true, the test statistic is asymptotically distributed as χ^2_{m-p}, where p is the number of parameters estimated.

3 Data

In this paper, quarterly data from 1980Q3 to 2009Q4 are used in estimating Abel's model. The returns on short-term instruments are employed as the return on the risk-free asset and these are obtained from Nikko Financial Intelligence.[1] The Fama-French's market portfolio returns are treated as the returns on the risky asset and these are obtained from Nikkei Portfolio Master.[2] Per capita consumption is computed as "Nondurable goods plus service consumption (benchmark year 2000)" divided by the estimates of the total population reported in the *Annual Report on National Accounts* in Japan. The per capita consumption data are seasonally adjusted using the X-12 ARIMA procedure.

[1]The returns on shor-term instruments contains interest-bearing instruments with maturities of three months or less (call, bill, gensaki, CD, CP and government short-term securities (excluding securites hel by Bank of Japan and the Government)).

[2]Fama-French's market factors in Japan are calculated by following Kubota and Takehara (2007).

To deflate all series, the "Nondurable plus service consumption" deflator published in the *Annual Report on National Accounts* is used.[3] Lagged values of the real return on the risk-free asset and the real return on the market portfolio, and the current and lagged values of the real consumption growth rate are used as instruments. For the GEL estimator, all variables that appear in the moment conditions should be stationary. The ADF test of Dickey and Fuller (1981) is used to check whether the variables satisfy the stationarity condition. Table I provides some descriptive statistics and the results of the ADF tests. For all the variables, the ADF test rejects the null hypothesis that the variable contains a unit root at conventional significance levels.

Table I: Descriptive Statistics and Unit Root Tests

	Mean	SD	Min	Max	ADF	Lag	$\mathcal{N}$
CG_t	1.0038	0.0090	0.9770	1.0312	-10.9889	0	118
CG_{t-1}	1.0036	0.0091	0.9770	1.0312	-10.7147	0	
r_t^f	0.0049	0.0063	-0.0143	0.0207	-6.1741	0	
r_t^m	0.0120	0.1045	-0.3335	0.2331	-7.5044	0	

"CG_t" denotes the gross real per capita consumption growth rate, "CG_{t-1}" denotes the first lagged gross real per capita consumption growth rate, "r_t^f" denotes the real return on risk-free asset, "r_t^m" denotes the real return on the market portfolio, "SD" denotes the standard deviation, "ADF" denotes the Augmented Dickey-Fuller (ADF) test statistics, "Lag" denotes the lag order selected by an information criterion of Akaike (1973), and "$\mathcal{N}$" denotes the number of observations. In computing the ADF test, a model with a time trend and a constant is assumed. The critical value at the 1% significance level for the ADF test is "-3.99". The null hypothesis that each variable has a unit root is clearly rejected at the 1% significance level.

4 Empirical Results

Table II presents the empirical results of estimating Abel's (1990, 1999) model using the 2S-GMM and the GEL estimators (CUE, EL and ET). In GEL estimation, the truncated kernel proposed by Kitamura and Stutzer (1997) is used to smooth the moment function (that is, equation (13) in this case) because Anatolyev (2005) demonstrates that, in the presence of correlation in the moment function, the smoothed GEL estimator of Kitamura and Stutzer (1997) is efficient.[4] In addition, the heteroskedasticity and autocorrelation consistent (HAC) covariance matrix of Andrews (1991) is employed to reduce estimation biases in the 2S-GMM and the GEL estimators.

[3]The "Nondurable plus service consumption" deflator is a weighted deflator computed using deflators of "Nondurable goods" and "Services" that are also published in the *Annual Report on National Accounts*.

[4]I employ the smoothed GEL estimator, but the optimal kernel weights do not exceed one. This suggests that the kernel smoothing has no effect.

Table II: Empirical Results

	ABEL				CCAPM			
	2S-GMM	CUE	EL	ET	2S-GMM	CUE	EL	ET
$\hat{\beta}$	0.9669	0.9991	0.9989	0.9990	0.9972	0.9985	0.9987	0.9981
	[0.0028]	[0.0021]	[0.0021]	[0.0021]	[0.0007]	[0.0008]	[0.0009]	[0.0008]
$\hat{\gamma}$	-4.7167	0.7906	0.8143	0.8077	0.5600	0.8502	0.8969	0.8026
	[0.4956]	[0.3918]	[0.3925]	[0.3923]	[0.1883]	[0.2306]	[0.2403]	[0.2204]
$\hat{\kappa}$	0.5152	1.4448	1.6098	1.5823	-	-	-	-
	[0.1056]	[3.6000]	[4.4160]	[4.2060]	-	-	-	-
p_J	0.5110	0.2894	0.2821	0.2859	0.9179	0.6227	0.6184	0.6142
DF	7	10	10	10	6	8	8	8

"$\hat{\beta}$" denotes the estimate of the subjective discount rate, "$\hat{\gamma}$" denotes the estimate of degree of the relative risk aversion, "$\hat{\kappa}$" denotes the estimate of the degree of time non-separability, "p_J" denotes the p-value for Hansen's J test and "DF" denotes the degrees of freedom for this J test. Andrews (1991) adjusted standard errors for each of the parameter are reported in brackets. R version 2.13.0 was used to compute the estimates. The starting values of the parameters are set equal to $\beta = 1$, $\gamma = 1$ and $\kappa = 1$ ($\beta = 1$ and $\gamma = 1$).

The GEL (CUE, EL and ET) estimates of β and γ are statistically significant at conventional levels. The GEL estimates of β are about 0.99; and the GEL estimates of γ are about 0.8. The estimates of κ are not statistically different from zero. The p-values for Hansen's J test are large enough that we cannot reject the null hypothesis that the moment conditions hold. I have confirmed that the GEL estimation results are robust to changes of the initial starting values. When I employ the 2S-GMM estimator, all parameter estimates are statistically significant at conventional levels, but the estimate of γ in Abel's model is about -4.7 which is not economically realistic and violates the models assumptions. In contrast to the GEL, I have confirmed that the 2S-GMM estimation results are not robust to changes of the initial starting values.

Table II also presents the empirical results of estimating the standard CCAPM model. The GEL estimates of β and γ are statistically significant at conventional levels. The estimates of β are about 0.99; and the estimates of γ range from 0.8 to 0.9. The p-values for Hansen's J test are large enough that we cannot reject the null hypothesis that the moment conditions hold. I have confirmed that the GEL estimation results are robust to changes of the initial starting values. When I employ the 2S-GMM estimator, the estimates of β and γ are also statistically significant at conventional levels. The estimates of β is about 0.99; and the estimate of γ is about 0.6 which is higher than the estimates from Abel's model. The p-values for Hansen's J test are large enough that we cannot reject the null hypothesis that the moment conditions hold. In contrast to the GEL, I also have confirmed that the 2S-GMM estimation results are unstable to changes of the initial starting values. These results suggest that: returns in the Japanese stock market can be explained by the standard CCAPM with power utility, and the GEL estimates are robust regradless of the model specification, but the 2S-GMM estimates are not.

I find that the GEL estimates are similar regardless of the model specification, but 2S-GMM estimates are quite different. As a result, we conclude that the 2S-GMM estimates are unreliable in small sample cases. I also find that Abel's (1990, 1999) habit model is rejected for Japan, and that returns in the Japanese stock market can be explained by the standard CCAPM with power utility.

5 Concluding Remarks

The purpose of this paper is to investigate whether Abel's (1990, 1999) "Catching up with the Joneses" model with consumption externality performs well in Japan. In order to estimate the parameters of the relevant Euler equation, the GEL estimators which improve on the poor performance of Hansen's (1982) 2S-GMM estimator small samples are employed.

As a result, it is found that: (i) Abel's (1990, 1999) "Catching up with the Joneses" model with consumption externality does not perform well empirically in Japan, (ii) returns in the Japanese stock market can be well explained using the standard CCAPM with power utility, and (iii) the GEL estimates are robust regradless of the model specification, but the 2S-GMM estimates are not.

References

Abel, A. (1990): "Asset Prices under Habit Formation and Catching up with the Joneses," *American Economic Review*, 80, 38–42.

——— (1999): "Risk Premia and Term Premia in General Equilibrium," *Journal of Monetary Economics*, 43, 3–33.

Ahn, S. C. and C. Gadarowski (2004): "Small Sample Properties of the GMM Specification Test Based on the Hansen-Jagannathan Distance," *Journal of Empirical Finance*, 11, 109–132.

Akaike, H. (1973): "Information Theory and an Extension of the Maximum Likelihood Principle," in *Second International Symposium on Information Theory*, ed. by B. Petroc and F. Csake, Akademiai Kiado, 267–281.

Anatolyev, S. (2005): "GMM, GEL, Serial Correlation, and Asymptotic Bias," *Econometrica*, 73, 983–1002.

Andrews, D. (1991): "Heteroskedasticity and Autocorrelation Consistent Covariance Matrix Estimation," *Econometrica*, 59, 817–858.

Baba, N. (2000): "Exploring the Role of Money in Asset Pricing in Japan: Monetary Considerations and Stochastic Discount Factors," *Monetary and Economic Studies*, 18, 159–198.

Bakshi, G. and A. Naka (1997): "An Empirical Investigation of Asset Pricing Models using Japanese Stock Market Data," *Journal of International Money and Finance*, 16, 81–112.

Balduzzi, P. and H. Kallal (1997): "Risk Premia and Variance Bounds," *Journal of Finance*, 52, 1913–1949.

Brown, B. W. and W. K. Newey (1998): "Efficient Semiparametric Estimation of Expectations," *Econometrica*, 66, 453–464.

Burnside, C. (1994): "Hansen-Jagannathan Bounds as Classical Tests of Asset-Pricing Models," *Journal of Business & Economic Statistics*, 12, 57–79.

Campbell, J. (2003): "Consumption-based Asset Pricing," in *Handbook of the Economics of Finance*, ed. by M. H. G.M. Constantinides and R. Stulz, North Holland, vol. 1B, chap. 13, 801–885.

Campbell, J. and J. Cochrane (1999): "By Force of Habit: A Consumption-Based Explanation of Aggregate Stock Market Behavior," *Journal of Political Economy*, 107, 205–251.

Cochrane, J. and L. Hansen (1992): "Asset Pricing Explorations for Macroeconomists," *NBER Macroeconomics Annual*, 7, 115–165.

Constantinides, G. (1990): "Habit Formation: A Resolution of the Equity Premium Puzzle," *Journal of Political Economy*, 98, 519–543.

Dickey, D. and W. Fuller (1981): "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root," *Econometrica*, 49, 1057–1072.

Donald, S. and W. Newey (2001): "Choosing the Number of Instruments," *Econometrica*, 69, 1161–1191.

Gali, J. (1994): "Keeping up with the Joneses: Consumption Externalities, Portfolio Choice, and Asset Prices," *Journal of Money, Credit & Banking*, 26, 1–8.

Hansen, L. (1982): "Large Sample Properties of Generalized Method of Moments Estimators," *Econometrica*, 50, 1029–1054.

Hansen, L., J. Heaton, and A. Yaron (1996): "Finite-Sample Properties of Some Alternative GMM Estimators," *Journal of Business & Economic Statistics*, 14, 262–280.

Hansen, L. and R. Jagannathan (1991): "Implications of Security Market Data for Models of Dynamic Economies," *Journal of Political Economy*, 99, 225–262.

——— (1997): "Assessing Specification Errors in Stochastic Discount Factor Models," *Journal of Finance*, 52, 557–590.

Hansen, L. and K. Singleton (1982): "Generalized Instrumental Variables Estimation of Nonlinear Rational Expectations Models," *Econometrica*, 50, 1269–1286.

Ikeda, S. and Y. Tsutsui (1996): "Asset Pricing with Consumption Externalities: An Empirical Analysis (Shouhi no Gaibusei to Shisan Kakaku, in Japanese)," in *Japanese Capital Markets* (*Nihon no Shihon Shijo*, in Japanese), ed. by T. Tachibanaki and Y. Tsutsui, Nihon-Hyouron Sha, chap. 2, 29–42.

Ito, M. and A. Noda (2010): "The GEL Estimates Resolve the Risk-free Rate Puzzle in Japan," Keio/Kyoto Global COE Discussion Paper Series, DP2010-007.

Kitamura, Y. and M. Stutzer (1997): "An Information-Theoretic Alternative to Generalized Method of Moments Estimation," *Econometrica*, 65, 861–874.

Kocherlakota, N. (1996): "The Equity Premium: It's Still a Puzzle," *Journal of Economic Literature*, 34, 42–71.

KUBOTA, K. AND H. TAKEHARA (2007): "Farther Validation of Effectiveness of Fama-French Factor Model (Fama-French Model no Yukousei no Saikensho, in Japanese)," *Gendai Finance*, 22, 3–23.

MEHRA, R. AND E. PRESCOTT (1985): "The Equity Risk Premium: A Puzzle," *Journal of Monetary Economics*, 15, 145–161.

——— (2003): "The Equity Premium Puzzle in Retrospect," in *Handbook of the Economics of Finance*, ed. by G. Constantinides, M. Harris, and R. Stulz, North Holland, vol. 1B, chap. 14, 887–936.

NEWEY, W. AND R. SMITH (2004): "Higher Order Properties of GMM and Generalized Empirical Likelihood Estimators," *Econometrica*, 72, 219–255.

NODA, A. (2011): "A Survey on Estimating CCAPMs," Mimeo.

OWEN, A. (1988): "Empirical Likelihood Ratio Confidence Intervals for a Single Functional," *Biometrika*, 75, 237–249.

SMITH, R. (2004): "GEL Criteria for Moment Condition Models," Mimeo.

STOCK, J., J. WRIGHT, AND M. YOGO (2002): "A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments," *Journal of Business & Economic Statistics*, 20, 518–529.

SUNDARESAN, S. (1989): "Intertemporally Dependent Preferences and the Volatility of Consumption and Wealth," *Review of Financial Studies*, 2, 73–88.

WEIL, P. (1989): "The Equity Premium Puzzle and the Risk-Free Rate Puzzle," *Journal of Monetary Economics*, 24, 401–421.