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BUSINESS CYCLE ASYMMETRY AND THE STOCK MARKET IN JAPAN

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Abstract: Speight (1997) has reported evidence of systematic asymmetric behaviour in business cycles defined by Japanese industrial production. This paper investigates whether or not this observed asymmetric behaviour can be explained by the stock market; in particular, it tests for a Granger causal relation from stock returns to industrial production. We consider threshold models to capture the asymmetric relationship between monthly Japanese industrial production growth rates and Nikkei index stock returns. We test for “steepness” in the relationship. The results provide strong evidence to support that negative returns have “steeper” effects on the business cycle than positive returns. Incorporating these findings into modelling the relationship between industrial production and the stock market will undoubtedly improve the prediction of business cycles, particularly their downturns. Since Japan is a major trading partner of many countries around the globe, the results are indeed very useful to local as well as foreign economic and business decision makers.

Key words: One-sided alternative; composite null; threshold model; asymmetry

JEL Classification: C12, E24 and E32

1. INTRODUCTION

Following the work of Mitchell (1927) and Keynes (1936), many economists have argued that major cyclical variables such as the unemployment rate, production and

interest rates display systematic asymmetric behaviour over various phases of the business cycle. Direct contributions to this view include, among others, Neftci (1984), Falk (1986), Hamilton (1989), Rotham (1991) and Sichel (1993). We adopt the following definition of the business cycle:

“Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion face of the next cycle; this sequence of changes is recurrent but not periodic; in duration, business cycles vary from more than one year to ten to twelve years”.

Burns and Mitchell (1946)

The business cycle hypothesis of Mitchell (1927) and Keynes (1936) is primarily two-fold: economic expansions are longer but less sharp than down turns. The significance of this issue for both theoretical and empirical work has been heavily stressed by many researchers over the years. The asymmetric nature of the business cycle cannot be represented adequately by any member of the wide class of standard linear models, suggesting the need to develop non-linear models to capture this feature. Sichel (1993) and others found two types of asymmetries in the business cycles of GDP, industrial production and unemployment series, these being “steepness” and “deepness”. According to Sichel’s (1993) evidence, steepness exists in a cycle when a moderate slope during expansions is followed by a relatively steep and negative slope during contractions. “Deepness” asymmetry occurs when the range from the mean to the peak is not equal to the range from the mean to the trough. In other words, troughs can be deeper than peaks. See McQueen and Thorley (1993) and Beaudry and Koop (1993) for more detailed definitions of asymmetry and analyses.

The objective of this empirical study is to investigate the nature of the relationship between the Japanese stock market and the business cycle. In particular, we test that stock returns Granger cause industrial production in Japan [see Granger (1969) for more details]. We investigate whether or not the stock market can explain the observed systematic asymmetric business cycle in the Japanese industrial production. Motivated by Cover (1992), we consider threshold models suggested by Tong (1990) and Terasvirta (1990) to capture the asymmetric nature of the business cycle. We also test for “steepness” in the relationship between the stock market and business cycle.

Investigation of business cycles in Japan received considerable attention in the recent literature; see, for example, Speight (1997). Speight (1997) reports evidence of statistically significant both steepness deepness in Japanese production, noting that the production growth rate has declined much more sharply than it increased, exhibiting asymmetric behaviour. It is important to detect the presence of such asymmetry in economic time series for several reasons. As has been argued before, if asymmetric behaviour is indeed systematic, then models capturing such behaviour endogenously

need to be developed. The models of economic series that generate sharp drops during contractions followed by gradual movements during expansions will have “better” predictive power. Otherwise, one would expect the “fit” to deteriorate considerably, particularly around turning points. Such models would also improve the forecasting of major economic variables such as unemployment rates, production and interest rates, which is a major concern of economic and business decision makers.

The reason for using the stock market to explain the asymmetry in the business cycle is that it is well-known that modern asset pricing models suggest that the expectations of future macroeconomic conditions have an important influence on the stock market. Therefore, the stock market has long been recognised as a predictor of the business cycle; we agree with an anonymous referee to this journal that this stylised fact is mainly based on empirical results. Moore (1983) notes that since 1873 stock prices have led the business cycle at eighteen of the twenty-three peaks and at seventeen of the twenty-three troughs. Overwhelming evidence in the literature suggests that the stock market is the best single leading indicator of the business cycle; see Fama (1981) and Domian and Louton (1995), for example. The reason for using the Japanese economy is that, as has been discussed before, a number of studies found evidence of the presence of asymmetry in the business cycle in Japanese production.

Numerous studies have found that the stock market is an indicator of future economic activity, and an increase in the stock market return is an indication of an upturn in the industrial production growth rates. We utilise this stylised fact and use the one-sided F statistics for testing hypotheses involving alternatives with inequality constraints, which are defined in the next section. There are two reasons for this: the familiar two-sided F statistic may not be appropriate to use when it is known that the industrial production and stock market are positively related, and the power of the test can be improved by taking account of the one-sided nature of the testing problem [see Sen and Silvapulle (1998), Silvapulle and Silvapulle (1995) and Wolak (1987)]. Although these one-sided F tests have been available for some time, they are not widely applied in economics and finance. In this respect, this paper contributes to the literature on hypothesis testing empirical in economics and finance, highlighting the importance and appropriateness of one-sided F -tests.

We test the composite null hypothesis of the asymmetric relationship between production and the stock market. If indeed the null is not rejected, the model taking account of such a relationship, as argued before, improves the prediction of business cycles, particularly the downturns. Empirical testing for such a null hypothesis to our knowledge is rather new in applied economics and finance. Thus, we believe this paper makes a substantial contribution to the empirical literature on business cycle asymmetry.

This paper is organised as follows: the next section briefly describes the models, the hypotheses of interest and defines the test statistics. Section 3 discusses the data series and the time series properties of the variables. Section 4 reports and analyses the empirical results and section 5 concludes the paper.

2. THE MODELS, HYPOTHESES AND THE TEST STATISTICS

In this section, motivated by Cover (1992), we specify the models reflecting the relationship between business cycles and the stock market including threshold models, the hypotheses of interest including equality constraints and “steepness” in the business cycle. We also introduce the test statistics when there are inequality constraints.

2.1 *The Models*

We first consider the conventional autoregressive model,

$$DP_t = \alpha_0 + \sum_{j=1}^p \alpha_j DP_{t-j} + \sum_{k=1}^q \beta_k R_{t-k} + e_t \quad t = 1, 2, \dots, n \quad (1)$$

where DP is the first differenced industrial production, R_t is the real stock return, p and q are the number of lags of DP_t and R_t respectively, e_t is assumed to be normal and serially uncorrelated and n is the sample size. The variables in the model are all assumed to be stationary. Appropriate values of p and q are chosen using the Akaike (1973, 1978) and Schwartz’s Bayesian information criteria. A crucial limitation of (1) is that it does not capture the asymmetric nature of the relationship between DP_t and R_t . In order to overcome this limitation, we modify (1) as follows:

Decompose R_t into two components:

$$RPOS_t = \begin{cases} R_t & \text{if } R_t \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

and

$$RNEG_t = \begin{cases} R_t & \text{if } R_t \leq 0 \\ 0 & \text{otherwise.} \end{cases}$$

Now, to capture the asymmetric relationship between DP and R , (1) may be generalised as

$$DP_t = \alpha_0 + \sum_{j=1}^p \alpha_j DP_{t-j} + \sum_{i=1}^q (a_i RPOS_{t-i} + b_i RNEG_{t-i}) + e_i \quad (2)$$

In (2), we defined $RPOS$ and $RNEG$ based on whether or not the stock return is above or below zero; thus, according to Tong’s (1990) terminology, the threshold parameter is zero. In setting the threshold parameter at zero we have assumed that returns below zero are bad news, indicating a future downturn in economic activity.

Now, the aim is to determine the threshold parameter—the actual return level—below which is bad news, using Akaike and Schwartz information criteria. Assuming such a parameter value is r , define high return (RH) and low return (RL) as,

$$RH_t = \begin{cases} R_t & \text{if } R_t \geq r \\ 0 & \text{otherwise} \end{cases}$$

and

$$RL_t = \begin{cases} R_t & \text{if } R_t \leq r \\ 0 & \text{otherwise.} \end{cases}$$

Now, model (2) may be modified as

$$DP_t = \alpha_0 + \sum_{j=1}^p \alpha_j DP_{t-j} + \sum_{i=1}^q (a_i RH_{t-i} + b_i RL_{t-i}) + e_i \quad (3)$$

We note that this model has sufficient flexibility to accommodate asymmetry as we have discussed earlier, and to allow the effect of R on DP to be zero for $|R| < r$ for some r .

2.2 The Hypotheses

To test whether or not stock returns Granger cause production growth rates, the null and alternative hypotheses take the form

$$H_0 : \beta_j = 0 \quad \text{for } j = 1, 2, \dots, q$$

and

$$H_1 : \beta \neq 0 \quad \text{for at least for one } i$$

(4)

We can test H_0 against H_1 using the usual F-ratio which asymptotically has a chi-squared distribution with q degrees of freedom. In accordance with the widely-held view, we assume that an increase in stock return is an indication of an upturn in future economic activity and hence an increase in industrial production growth rates. If model (2) is adopted, then to test whether $RPOS$ has any effects on DP , the null and alternative hypotheses may be stated as

$$H_0^+ : a_i = 0 \quad \text{for } i = 1, 2, \dots, q$$

and

$$H_1^+ : a_i \geq 0 \quad \text{for all } i \text{ and } a_i > 0 \text{ for at least one } i$$

(5)

respectively; similarly, to test whether or not $RNEG$ has any significant effects on DP , assuming that any such effect cannot be non-negative, the null and alternative hypotheses may be formulated as

$$H_0^- : b_i = 0 \quad \text{for } i = 1, 2, \dots, q$$

against

$$H_1^- : b_i \geq 0 \quad \text{for all } i, \text{ and } b_i > 0 \text{ for at least one } i$$

(6)

respectively. If model (3) is adopted instead of (2), the hypotheses in (5) and (6) respectively are still valid formulations for testing whether or not RH and RL separately cause DP .

Now, to test whether "steepness" in production growth rates could be explained by stock market returns by testing whether negative returns have steeper effects than positive returns on production. This is equivalent to testing

$$H_{a0} : b_i \geq a_i \quad \text{for } i = 1, 2, \dots, q$$

against

$$H_{a1} : b_i < a_i \quad \text{for some } i$$

(7)

in model (2) or (3). Let $b_i = a_i + \delta_i$. Substituting this in (2) we obtain

$$\begin{aligned} DP_t &= \alpha_0 + \sum_{j=1}^p \alpha_j DP_{t-j} + \sum_{i=1}^q (a_i RPOS_{t-i} + (a_i + \delta_i) RNEG_{t-i}) + e_t \\ DP_t &= \alpha_0 + \sum_{j=1}^p \alpha_j DP_{t-j} + \sum_{i=1}^q (a_i (RPOS_{t-i} + RNEG_{t-i}) + \delta_i RNEG_{t-i}) + e_t \end{aligned} \quad (8)$$

Similar substitution in (3) yields

$$DP_t = \alpha_0 + \sum_{j=1}^p \alpha_j DP_{t-j} + \sum_{i=1}^q (a_i (RH_{t-i} + RL_{t-i}) + \delta_i RL_{t-i}) + e_t \quad (9)$$

Now, in models (8) and (9), the hypotheses in (7) are equivalent to $H_{00} : \delta_i > 0$ for $i = 1, 2, \dots, q$, and $H_{11} : \delta_i \not\geq 0$ for some $i, i = 1, \dots, q$, respectively.

2.3 The Test Statistics

Let X denotes the vector of all regressors and β be the vector of all parameters in (2). Now, we can restate the null and alternative hypotheses defined in (5) and (6) as $H_0 : R\beta = 0$ and $H_1 : R\beta > 0$ respectively, with the restriction matrix R appropriately defined. The likelihood ratio (LR) is usually expressed as,

$$LR = -2(\ln \tilde{L} - \ln \hat{L}) \quad (10)$$

\tilde{L} and \hat{L} are the maximum values of the likelihood function under the null and alternative hypotheses respectively. Since H_1^+ in (5) is a one-sided alternative, the asymptotic null distribution of the LR statistic for testing H_0^+ against H_1^+ is a weighted average of chi-squared distributions, known as a chi-bar squared distribution; for example, see Gourieroux et al. (1982), Wolak (1987), and the survey article Sen and Silvapulle (1999) for details. Further, the F -statistic for testing these hypotheses has a weighted average of F distributions.

Suppose that the LR statistic for the hypothesis testing problem in (5) is computed as c , then the asymptotic p -value is given by

$$p\text{-value} = \Pr[LR \geq c] = \sum_{k=1}^q \Pr[\chi_k^2 \geq c] w(q, k, \Omega) \quad (11)$$

where Ω is the covariance matrix defined as $R(X'X)^{-1}R'$ and $w(q, k, \Omega), k = 1, \dots, q$ are some non-negative weights. The weight $w(q, k, \Omega)$ has the following interpretation. Let $Z \sim N(0, \Omega)$, and \tilde{Z} be the point in the positive quadrant $\{z \in R^q : z_1, \dots, z_q \geq 0\}$ that is closest to Z in the following sense

$$(Z - \tilde{Z})' \Omega^{-1} (Z - \tilde{Z}) = \text{Min}\{(Z - z)' \Omega^{-1} (Z - z) : z_1, z_2, \dots, z_q \geq 0\}.$$

Now, $w(q, k, \Omega)$ is the probability that \tilde{Z} has exactly k positive components. A simple way of computing $w(q, k, \Omega)$ as suggested by Wolak (1987) is to take 1000 draws on Z , compute \tilde{Z} for each of these draws, and then approximate $w(q, k, \Omega)$ by the proportion

of times \tilde{Z} has exactly k positive components. Previous simulation studies show that these computed weights are sufficiently accurate.

For testing the “steepness” hypothesis $H_{00} : \delta_i \geq 0$ for all i against $H_{11} : \delta_i \not\geq 0$ for some i , the parameter space under H_{00} can be expressed as $\theta_H = \{\beta | R\beta \geq 0\}$ for some R . Note that the null is a composite hypothesis. The p -value of the likelihood ratio (LR) statistic for testing the above hypotheses is computed as

$$\begin{aligned} p\text{-value} &= \sup_{\beta \in H} \text{pr}[LR \geq c] \\ &= \text{pr}[LR \geq c]_{\beta=0} \end{aligned} \quad (12)$$

The point $\beta = 0$ is the least favourable null value of β . The p -value defined in (12) can be computed using an expression similar to (11).

3. TIME SERIES PROPERTIES OF DATA

The monthly Japanese Industrial Production (IP) series, and Nikkei Stock Price Index ($NSPI$) were collected from the DATA STREAM data base available at La Trobe University, for the period January 1974 to December 1994, providing $n = 252$; both series are measured in logarithm. The nominal stock return is computed as $R_t = (NSPI_t - NSPI_{t-1}) \times 100$, and the growth rate of production is defined as $DP_t = (IP_t - IP_{t-1}) \times 100$.

Using the augmented Dickey and Fuller (1979) test (ADF) and Kwiatkowski, Phillips, Schmidt and Shin’s (1992) test, $KPSS$ hereafter, we examined the time series properties of the IP , $NSPI$, R and DP . The results indicate that the IP and $NSPI$ are $I(1)$ and R and DP are $I(0)$; see Table 1 for the tests’ results. Therefore, the first difference of the production series, denoted by DP , is considered as the dependent variable in all models, eliminating the trend. We have also tested whether or not the IP and $NSPI$ which are $I(1)$ are cointegrated and found to be not cointegrated. Note that cointegration of two variables implies that the error correction model should be used for causality testing and that there exists a causal relation between these two variables at least in one direction. The reverse need not be true, meaning that exiting a causal relation from one variable to the other does not imply that they are not cointegrated.

Table 1. Application of Unit Root Tests.

Series	Test statistics					
	ADF			KPSS		
	$l = 2$	$l = 4$	$l = 6$	$l = 2$	$l = 4$	$l = 6$
IP	-1.42	-1.90	-1.94	0.82	0.62	0.48
DP	-4.20	-4.52	-4.54	0.54	0.21	0.14
NI	-1.48	-1.60	-1.98	0.92	0.85	0.72
R	-4.59	-4.82	-4.84	0.21	0.16	0.12

Note: The 5% critical value of the ADF and $KPSS$ are -2.82 and 0.43 respectively without time trend, and l is the number of lags included to whiten the noise.

Table 2. Production Responses to the Stock Market in Symmetric Model (1):
Testing Restrictions that $\gamma_1 = \dots = \gamma_q = 0$.

Lag lengths (p, q)	Reat stock return		
	F -Statistic	SBC	AIC
(9, 3)	5.88	318.06	305.30
(9, 4)	4.32	316.01	302.31
(9, 5)	4.59	321.60	304.96
(10, 3)	5.02	320.93	318.16
(10, 4)	4.69	322.02	313.34
(10, 5)	4.13	325.55	313.99

Note: 1) Both AIC and $SBIC$ information criteria identify that optimum (p, q) is (9, 4).
2) The AIC is computed as $\{n \log(RSS) + 2k\}$ while the SBC is computed as $\{n \log(RSS) + k \log(n)\}$.

4. EMPIRICAL ANALYSIS AND THE RESULTS

The conventional autoregressive model (1) was estimated as a benchmark for models with asymmetries. By definition (1) is the symmetric response model since it is assumed that the magnitudes of the effects of a unit positive and a unit negative stock returns on production are identical. To conduct Granger causality testing, the key requirement for the identification of a bivariate model like (1) is the appropriate number of lag terms p and q be included in the model. A widely-used method of lag length selection is the Akaike (1973, 1978) information criterion (AIC), based on maximising the log likelihood of a model. For linear autoregressive models, this is equivalent to minimising $\{n \log(RSS) + 2k\}$ where RSS is the residual sum of squares and k is the number of regressors. We also use Schwartz's Bayesian information criterion ($SBIC$), which is computed as $\{n \log(RSS) + k \log(n)\}$.

The model (1) was estimated by OLS for all 64 combinations of lag lengths p and q between 1 and 24. We observed that the AIC values generally increased for lag lengths p and q greater than 10 and 5 respectively. The results for $p = 9$ and 10 and $q = 3, 4, 5$ are reported in Table 2. Based on AIC and $SBIC$, the optimum value of (p, q) was selected as (9, 4) for which the F -ratio is also highly significant at the one per cent level, indicating that stock returns Granger cause production growth rates. A limitation of model (1) is that the positive and negative returns are being forced to have equal effects in magnitude on the production.

Now, we consider the threshold model (2) with the threshold parameter 0. The one- and two-sided F -ratios corresponding to various values of (p, q) and for positive and negative returns were computed and are reported in Table 3. The alternative hypothesis for the one-sided testing problem is that the coefficients are all negative, based on the prevalent view that there is an inverse relationship between past stock returns and the current production. The results provide convincing evidence that negative returns have a more certain effect on business cycles because F -ratios for the negative returns are

Table 3. Production Responses to Positive and Negative Stock Returns in Model (2).

Lag length (p, q)	<i>PROS</i>		<i>RNEG</i>	
	Two-sided <i>F</i> -test	One-sided <i>F</i> -test	Two-sided <i>F</i> -test	One-sided <i>F</i> -test
(9, 3)	1.40 (0.25)	1.40 (0.09)	8.89 (0.00)	8.89 (0.00)
(9, 4)	2.31 (0.06)	2.31 (0.02)	9.25 (0.00)	9.25 (0.00)
(9, 5)	3.77 (0.00)	3.77 (0.00)	10.42 (0.00)	10.42 (0.00)
(10, 3)	2.78 (0.04)	2.78 (0.00)	8.08 (0.00)	8.08 (0.00)
(10, 4)	2.12 (0.08)	2.12 (0.03)	7.15 (0.00)	7.15 (0.00)
(10, 5)	2.91 (0.02)	2.91 (0.00)	6.99 (0.00)	6.99 (0.00)

Note: a) Figures in parentheses are the p -values. The two-sided test statistic has an F distribution with (q, ν) degrees of freedoms where ν is the error degrees of freedom. The one-sided test statistic has a weighted average of F -distributions. b) The AIC and $SBIC$ select the optimum values of (p, q) as (9, 5), and the corresponding values of $SBIC$ and AIC are 315.09 and 301.11 respectively.

significantly higher than those for positive returns. It is also noticeable that the two-sided F -test fails to detect the relationship between positive returns and the production in some cases, whereas the one-sided F -test succeeds. Further, the values of AIC and $SBIC$ of model (1) are much larger than those of model (2) with optimum lag (9, 5), supporting the superiority of model (2).

Now, to estimate the threshold parameter r in (3), the model is estimated for lag lengths p and q with each varying from 1 to 10. For each combination of p and q , we define RH and with the threshold parameter varying from -0.07 to 0.07 with an increase of 0.001 ; the results are reported in Table 4. The optimal threshold parameter r in (3) is computed as 0.034 and the corresponding lag length (p, q) is (9, 5) for which the values of AIC and $SBIC$ of model (3) are only marginally smaller than those of model (2) with the optimum lag (9, 5). These results thus reinforce the previous findings for model (2).

The composite hypothesis that $b_i \geq a_i$ for $i = 1, \dots, q$, reflecting the negative returns having steeper effects on production than the positive returns in model (2) is tested and the results are reported in Table 5; the same hypothesis relating RH and RL to the production in (3) is also tested with the results presented in the same table. The p -values of computed LR statistics are significantly greater than 0.05 nominal level in many cases, thus there is overwhelming evidence to support the “steepness” null hypothesis in both models (2) and (3). Since the residuals of the models appear not to be normally distributed, Silvapulle’s (1992) one-sided robust tests which are based on an M -estimator and are robust against non-normal errors was also used. Although the

Table 4. Production Responses to *RH* and *RL* in (3).

Lag length (<i>p, q</i>)	<i>RH</i>		<i>RL</i>	
	Two-sided <i>F</i> -test	One-sided <i>F</i> -test	Two-sided <i>F</i> -test	One-sided <i>F</i> -test
(9, 3)	2.35 (0.08)	2.35 (0.03)	7.29 (0.00)	7.29 (0.00)
(9, 4)	2.68 (0.04)	2.68 (0.00)	7.99 (0.00)	7.99 (0.00)
(9, 5)	4.59 (0.00)	4.59 (0.00)	9.89 (0.00)	9.89 (0.00)
(10, 3)	2.29 (0.08)	2.29 (0.02)	8.34 (0.00)	8.34 (0.00)
(10, 4)	2.80 (0.03)	2.30 (0.01)	7.60 (0.00)	7.60 (0.00)
(10, 5)	3.43 (0.01)	3.20 (0.01)	7.20 (0.00)	7.20 (0.00)

Note: a) See footnote a) for Table 2. b) The *AIC* and *SBIC* select the optimum values of (*p, q*) as (9, 5), and the corresponding values of *SBIC* and *AIC* are 314.98 and 301.01 respectively.

Table 5. Testing for “Steepness” Hypothesis in Models (2) and (3).

$$H_0 : a_i \geq b_i$$

$$H_1 : a_i \not\geq b_i$$

Lag length (<i>p, q</i>)	Model (2) <i>F</i> -ratio	Model (3) <i>F</i> -ratio
(9, 3)	1.06 (0.32)	0.91 (0.39)
(9, 4)	0.43 (0.70)	0.41 (0.61)
(9, 5)	0.99 (0.45)	0.86 (.40)
(10, 3)	0.83 (0.46)	0.81 (.35)
(10, 4)	1.24 (0.27)	1.08 (0.32)
(10, 5)	1.88 (0.11)	1.58 (0.14)

Note: a) The *p*-values were computed using (11) with different sets of weights.
b) See footnote (a) for Table 4.

robust statistics are higher than the corresponding reported ones, conclusions are largely unchanged.

5. CONCLUSION

It has long been argued that major cyclical variables such as the unemployment rate and production display systematic asymmetric behaviour over various phases of the business cycle. This paper has investigated whether or not the observed asymmetric behaviour in the Japanese production can be explained by the stock market. We considered threshold models developed by Tong (1990) and Terasvirta (1990) to capture the asymmetric behavior of the relationship between monthly Japanese production and Nikkei stock returns. The data series used in this study cover the period January 1974 to December 1994. Using the one-sided testing procedures we tested a range of null hypotheses of restrictions against inequality constraints and the composite null hypothesis involving “steepness” in business cycles. The results provide strong evidence to support that negative returns have significant effects on the Japanese industrial production. Moreover, the results support the claim that negative returns have “steeper” effects on the business cycle than positive returns. Incorporating these findings in the model will have “better” predictive power of business cycles particularly the downturns. This paper, we believe, makes a substantial contribution to the empirical literature on testing for systematic business cycle asymmetry.

Since Japan is a major trading partner of many countries around the globe, the results are indeed very useful to local as well as foreign economic and business decision makers. Further, although the methodology used in the paper for testing the asymmetric relationship between Japanese business cycle and the stock market, it can be used to test for the asymmetric relationship among the variables in a wider context.

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