Labour Force Participation and the Business Cycle:

A Comparative Analysis of Europe, Japan and the United States

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ABSTRACT

Using OECD data from 1970 until 1995, we estimate systems of labour force participation equations, disaggregated by age and sex, for the United States, Japan, France and Sweden. We simulate the path of participation rates following shocks to GDP and also test for asymmetric responses to shocks occurring in upward and downward phases of the cycle. Our methodology is especially pertinent to the issue of hidden unemployment and the "discouraged worker effect". We find that this effect is essentially a female phenomenon with a particular concentration among 45 to 54 year olds.

Key words: Participation rates; business cycle; asymmetric responses; discouraged worker effects.

JEL classificiation: J21; E32.

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1 Introduction[*]

The subject of labour force participation has been neglected in the burgeoning literature on employment, unemployment and the business cycle.[1] Yet, workers' participation decisions in the face of booms and recessions are integral - alongside the more familiar labour input variables such as employment, hours and effort - to a complete understanding of how labour markets adjust to macro-economic fluctuations. Our central interest in this paper is to investigate the responses of participation rates to business cycle "shocks". We differentiate between females and males, with each gender broken down by age group. The analysis is undertaken for Sweden, France[2], Japan and the United States over the period 1970 - 1995.

We are especially interested in two inter-related aspects of cyclical movements in participation rates. Both link to the idea of under-recorded or "hidden" unemployment stemming from economic events that discourage workers from participating in the labour market during recessions. First, in line with most other studies (e.g. Pencavel, 1986), we seek to distinguish between temporary and more sluggish participation responses to deviations from trend growth. Second, we are interested in testing whether participation responses to upward fluctuations in the cycle are symmetric to those with respect to downward fluctuations. Both of these types of measure are fundamental to gauging the relative importance of 'the discouraged worker effect'. This is especially true of asymmetric response patterns. To the extent that workers are *permanently* discouraged from participating in the labour market during recessionary periods, we might anticipate that patterns of downward participation response will not correspond with upward movements. This

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[1] Interestingly, the subject appears to have been of much more interest in the 1960s - as exemplified by the vast volume produced by Bowen and Finegan (1969) - when macro economic fluctuations were far less severe than in later decades.

[2] As we mention below, our choices of Sweden and France add to the wide diversity of cyclical labour market experience of our sample countries over the past several decades. France is a major EU country and a leading current example of an economy with a problematic inflexible labour market. For well known reasons, particularly concerned with relatively high female participation rates, Sweden has always been important in the related literature. In part, however, our choice of European representative countries has been predicated on poorer data availability for other major European economies. For example, comparable U.K. participation data are not available before 1984 while German data are complicated by the 1989 re-unification.

might particularly relate to pre-retirement cohorts of workers who are more likely to regard decisions not to participate as irreversible. For example, it may be difficult to persuade prospective employers to re-invest in the human capital of older workers, due to the erosion of skills during spells of non-participation, given relatively short expected investment amortisation periods.

Differentiating by age group is clearly important in work on participation rates. Perhaps the main catalyst behind policy makers' growing attention to the subject has been the marked fall in the ratio of employment to population of older men[3]. This phenomenon has been observed, without exception, throughout the OECD group of countries (OECD Employment Outlook, 1992)[4]. To the extent that these trends represent involuntary "retirements", they may signal that the problem of growing male unemployment in OECD countries is more acute than official statistics indicate. Declines in participation rates among older men have not nearly been so comprehensively matched by equivalent females. A major age-related issue with respect to females concerns the postponement of child rearing, perhaps for reasons linked to the cost of child care (Connelly, 1992).

Our choice of countries reflects wide variations in social, structural and labour market characteristics that relate directly or indirectly to participation. Sweden has relatively high female participation. France has experienced an exceptionally steep decline in male participation. Japan has high participation among older male workers as well as growing participation rates among older female workers (Yamada et al., 1990). Contrasts also occur in related labour market contexts. Japanese employment adjustment is relatively sluggish (Gordon, 1982, Hart and Malley, 1996, Vecchi, 1996). Relatively high unemployment among certain age groups has been a major concern in

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[3] A second major trend has been a marked fall in the participation among the youngest work groups, due in part to greater participation in higher education. See the discussion relating to Tables 1.a and 1.b.

[4] The OECD report defines older workers as those aged 55 and above. "By 1990, the Japanese participation rate of 44 per cent was the highest among the OECD countries, even though this represents a decline of 8 percentage points since 1965. Italy, at 10 per cent, still has the lowest rate. Between these two extremes there was an average decline of 12.5 percentage points in the participation rate of older workers, 1965 to 1990" (OECD Employment Outlook, 1992, 196).

Europe (OECD, 1994). Post-war Japanese recessions have tended to be both of shorter duration and more modest than those in the United States.[5]

In Section 2, we discuss basic levels and trends in participation rates in the five selected countries. Our modelling approach is presented in Section 3. Data and estimation results are outlined in Section 4. We then concentrate on examining simulations of participation reactions to shocks in business sector GDP, differentiating by age and sex. Our detailed results are summarised in a Results Appendix. Conclusions are presented in Section 5 where we concentrate on relating our findings to international comparative unemployment experience.

2 The background picture

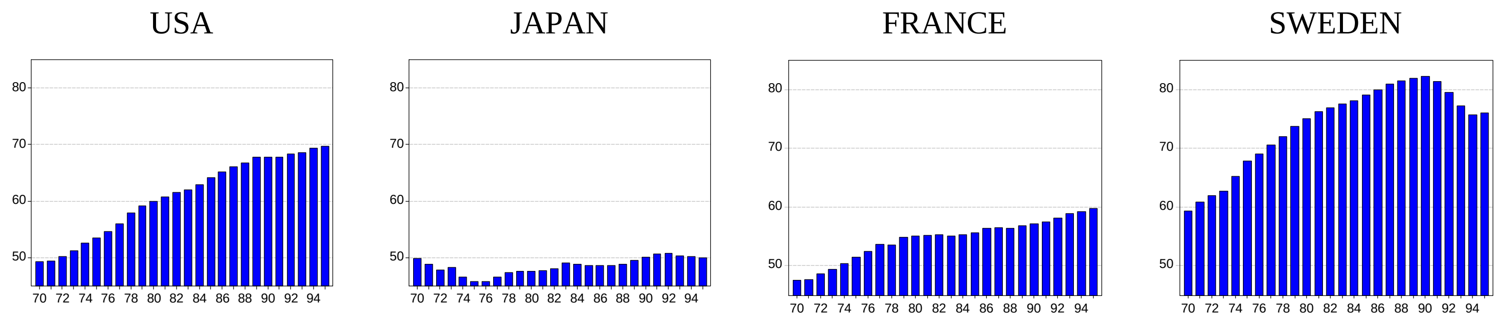
Figure 1 displays the levels and trends in female and male labour force participation rates for our four countries over the past 25 years. The gender contrast is quite stark. The general picture, with a few exceptional sub-periods, is that of sustained rises in female participation rates matched by equally systematic falls in the male rates.

There is evidence of one period that runs contrary to these trends in the case of female participation in Japan. Female participation drops around the time of the first OPEC price shock, but subsequently begins a long-term rise. While Figure 1 shows that female participation in Japan responded negatively to the recession of the early 1990s, the marked fall experienced in the early 1970s has not been repeated during subsequent economic downturns. Aoki (1988) claims that in the earlier period, a fall in demand tended to discourage a large proportion of Japanese females from job search and they retired from the labour market. In fact, discouraged-worker effects appear to be a significant labour market feature in Japan, particularly in the 1970s. Estimates quoted by Aoki for 1978 show that the proportion of discouraged workers who were not in the labour force was 8.9

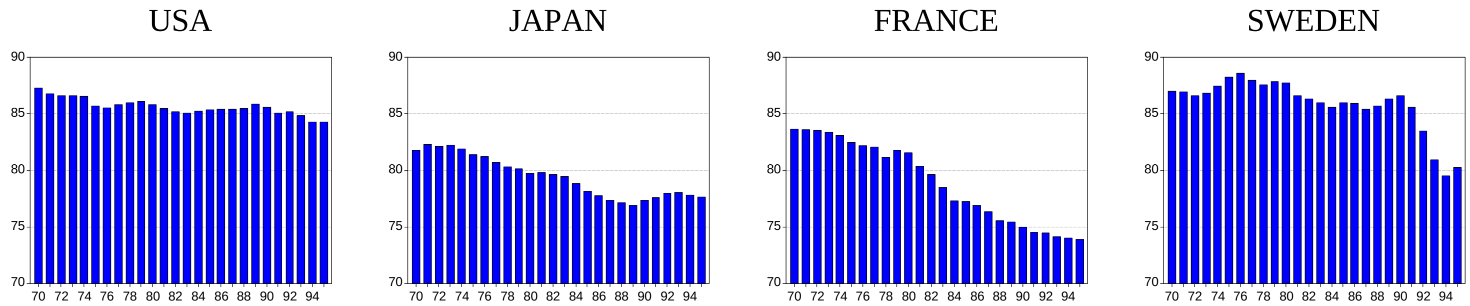
[5] For example, Odagiri (1991) argues that Japanese managers, expecting any given recession to be mild and short-lived, are more likely to be able to avoid major variations in worker layoffs.

FIGURE 1: INTERNATIONAL TRENDS IN PARTICIPATION RATES

Female Participation Rates



Male Participation Rates



Notes:
Data are from OECD Labour Force Statistics.
Participation rate = Labour Force aged 15-64 ÷ Population aged 15-64
For Japan only participation rates include those over 65, since older workers make up 7% of the total labour force as compared with <3% elsewhere.

percent in Japan and 1.4 percent in the United States, which compare with respective unemployment rates in the same year of 2.2 and 6.0 percent. Aoki goes on to state (pp.172/3) that "recent studies suggest that the effect of "discouragement" is becoming weaker and the phenomenon of "involuntary" part-time workers has become more common".

Another exceptional period occurs in Sweden. Along with the United States, Sweden has experienced the biggest rise in female participation over the entire period but, during the 1990s, some retrenchment has taken place. At the same time, there was an accelerated decline in male participation in Sweden. Recent falls in Swedish participation rates of both sexes have accompanied steep rises in unemployment rates. Over the period, however, Sweden has enjoyed exceptionally high female participation rates. Almost certainly, this has been due in part to the operation of a high quality child care system, which is specifically designed to accomodate parents' working time (Connelly, 1992; Gustafsson and Stafford, 1992).

More detailed data are presented in Tables 1a and 1b. Reflecting the cross-sectional dimension of our later econometric estimation, these Tables contain breakdowns of participation rates by age. Note that the middle-age range for males is 25 to 54 whereas this range for females is broken into three categories, each spanning 10 years. The latter disaggregation is intended to capture possible systematic shifts in the ages of child rearing and return to the labour force over the entire period. A striking feature of the Tables is that, in 1995, the youngest and oldest age groups of both sexes display significantly lower participation rates than the middle groups. The contrast is particularly evident with respect to both females and males in France as well older females in Japan.

These differences in levels among females is also generally reflective of annual changes between 1970 and 1995. With the exception of the oldest age categories in the United States and Sweden, average negative changes over the period among the oldest and youngest groups contrast with average positive changes among the middle groups. With the exception of Sweden, rises in female participation stem essentially from the 25 to 54 age groups.

TABLE 1a FEMALE PARTICIPATION RATES - SUMMARY STATISTICS

	Age Group					
USA	15-24	25-34	35-44	45-54	55+	All
% Participation Rate in 1995	62.3	74.9	77.2	74.4	49.2	69.7
% Share in Total	16.50	25.50	27.20	19.40	11.40	100
Av. Annual % Change 1970-95	-0.72	1.99	1.86	1.52	0.57	1.49
JAPAN						All
% Participation Rate in 1995	47.2	60.3	65.3	69.4	29.6	50.0
% Share in Total	15.90	18.50	20.20	25.20	20.40	100
Av. Annual % Change 1970-95	-0.35	1.35	0.64	0.69	-0.05	-0.26
FRANCE						All
% Participation Rate in 1995	26.7	78.6	78.5	74.2	30.9	54.5
% Share in Total	9.10	29.60	29.60	23.30	8.40	100
Av. Annual % Change 1970-95	-2.14	1.49	1.99	1.53	-1.23	0.82
SWEDEN						All
% Participation Rate in 1995	49.9	80.8	88.5	88.7	62.5	76.1
% Share in Total	11.60	23.70	24.30	26.10	14.30	100
Av. Annual % Change 1970-95	-0.21	1.45	1.26	1.31	1.74	1.12

TABLE 1b MALE PARTICIPATION RATES - SUMMARY STATISTICS

	Age Group			
USA	1524	2554	55+	All
% Participation Rate in 1995	70.2	91.6	65.9	84.3
% Share in Total	16.00	71.80	12.20	100
Av. Annual % Change 1970-95	-0.08	-0.13	-0.88	-0.93
JAPAN				All
% Participation Rate in 1995	48.0	97.5	61.1	77.6
% Share in Total	11.50	65.50	23.00	100
Av. Annual % Change 1970-95	-0.85	-0.01	-0.44	-0.28
FRANCE				All
% Participation Rate in 1995	32.7	94.8	41.5	78.9
% Share in Total	9.40	81.80	8.80	100
Av. Annual % Change 1970-95	-2.31	-0.08	-2.71	-0.59
SWEDEN				All
% Participation Rate in 1995	49.4	89.8	69.9	80.2
% Share in Total	11.00	73.80	15.20	100
Av. Annual % Change 1970-95	-0.80	-0.11	-0.70	-0.28

There are two further features worth noting in the case of females. First, Japan exhibits slightly negative growth over the entire period in marked contrast to strongly positive growth in female participation in the other three countries. Second, Swedish females in the 55+ group exhibit the *largest* average growth, unlike the other three countries were maximum growth occurs either within the 25-34 or the 35-44 age groups.

All male age groups in Table 1b display average negative growth over the period. As expected, the oldest 55+ groups exhibit marked declines in participation rates. The relative size patterns are not uniform, however. While largest negative growth occurs within the 55+ age group in the United States and France, it occurs among the 15-24 year olds in Japan and Sweden. One clear contributory factor in the participation decisions of older workers through time has been the growth and expansion of social security provision (e.g. Perotti and Welch, 1994).

3 Modelling strategy

(a) The cycle measure

In measuring the cycle, we have opted to focus on business sector GDP. We have purposely avoided using an employment or unemployment based measure of the cycle for two main reasons. First, employment or unemployment already captures some labour market dynamics, which in turn incorporate inertia in the response to the underlying cycle. Second, as shown by Elmeskov and Pichelman (1993), in some countries, like Japan, employment fluctuations display little covariation with output variations.

The OECD business sector database (release 2, 1996) provides comparable business sector GDP data for each country over a reasonably long period (early 1960s onwards on a quarterly basis). In addition to allowing easy comparison across countries, focusing on the business sector allows us to avoid undue influence from asynchronous cycles or trends particular to the government sector which could distort the overall trend-cycle decomposition.

A number of approaches to trend-cycle decomposition are available in principle. A popular method, particularly in U.S. based empirical work, involves application of the HP filter (Hodrick and Prescott, 1980). HP based cycle measures constructed for the U.S. accord well with the NBER's view on turning points and the amplitude of successive cycles. However, the HP filter is less successful when applied to other countries. For example, Harvey and Jaeger (1991) show that HP detrending generates implausibly erratic cyclical behaviour when applied to Austrian GDP. They advocate using a structural time series model to separate out volatility in the irregular component from smooth trended and cyclical components.

We follow Harvey and Jaeger's suggested approach, estimating a separate structural time series model for each country's business sector GDP. In this framework we can think of business sector GDP as composed of three components:

$$y_t = \mu_t+\psi_t+\varepsilon_t \qquad t=1..T \qquad (1)$$

where y_t is (logged) business sector GDP, μ_t is the trend, ψ_t is the cycle and ε_t is the irregular component.

The stochastic trend is a local linear trend defined as

$$\mu_t = \mu_{t-1}+\beta_{t-1}+\eta_t \qquad \eta_t\sim NID(0,\sigma_\eta^2) \qquad (2)$$

$$\beta_t = \beta_{t-1}+\varsigma_t \qquad \varsigma_t\sim NID(0, \sigma_\varsigma^2) \qquad (3)$$

where β_t is the slope and η_t and ς_t are unrelated normal white noise disturbances.

The stochastic cycle is generated as

$$\psi_t = \rho \cos \lambda_c\psi_{t-1}+\rho \sin \lambda_c\psi^*_{t-1}+\chi_t \qquad (4)$$

$$\psi^*_t = -\rho \sin \lambda_c\psi_{t-1}+\rho \cos \lambda_c\psi^*_{t-1}+\chi^*_t \qquad (5)$$

where ρ is a damping factor such that $0 \leq\rho\leq 1$, λ_c is the frequency of the cycle in radians, χ_t and χ_t* are both NID$(0,\sigma_\chi^2)$, ε_t is NID$(0,\sigma_\varepsilon^2)$ and the irregular components, ε_t, η_t, ζ_t, and χ_t, are taken to be independent of each other.

Estimation of the hyperparameters (σ_η^2, σ_ς^2, σ_χ^2, ρ, λ_c, σ_ε^2) is carried out by maximum likelihood in the frequency domain and the estimated cyclical component is obtained using STAMP (Version 5.0). Within this framework there are some notable special cases. If $\sigma_\varsigma^2 = 0$ the stochastic trend reduces to a random walk with drift. If $\sigma_\eta^2 = 0$ it becomes deterministic ie. $\mu_t = \mu_0 + \beta_t$.

Our structural time series models are estimated using the full sample of quarterly data available for each country. Following Koopman et al. (1995), we jointly estimate a model of business sector GDP with business sector investment; the investment series exhibits a more pronounced business cycle and enables us to obtain more robust and precise estimates of each cyclical component in business sector GDP. For each of our countries we find that a smooth trend-plus-cycle decomposition provides a good description of the data. In this case $\sigma_\varsigma^2 > 0$ but $\sigma_\eta^2 = 0$.[6]

The annualised cycles in business sector GDP which result from the country specific bivariate structural time series models are graphed in Figure 2. These cycle measures are included in our participation rate equations, though the estimation period for these equations is predicated by the availability of age and sex specific population and labour force data and hence restricted to 1972-1995.

(b) Estimation of the participation equations

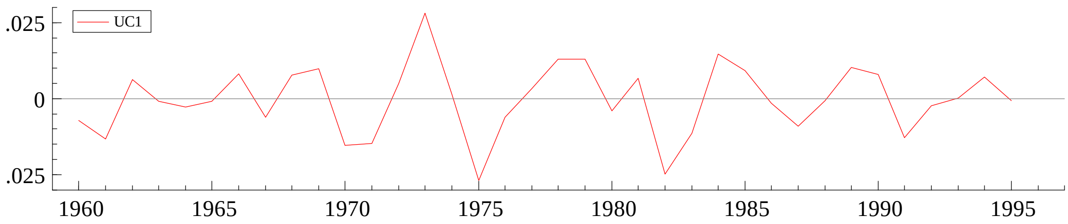
The participation rate data are derived form unemployment, employment and population series as published in OECD Labour Force Statistics 1996 (part III)**.** Females are split by age into five groups: 15-24, 25-34, 35-44, 45-54, 55-64. The male groups are: 15-24, 25-54 and 55-64.

Our main empirical focus is on the scale and persistence of cyclical influences on participation rates. Of course, if we are to identify these cyclical effects, we still need to account for trended behaviour in participation. A simple inspection of the participation rates in Figure 1 is sufficient to show that

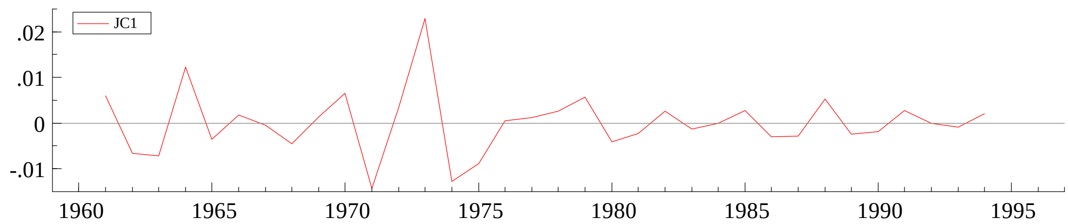
[6]As noted in Harvey and Jaeger (1991), the structural time series model for U.S. business sector GDP generates a cycle which is almost identical to the detrended series which results from the application of the HP filter. However, it is important to note that they found that this similarity does not obtain for other countries. We find that the smooth trend + cycle structural time series model is able to extract plausible cyclical behaviour in each of our countries, while HP detrending (with the standard smoothing parameter) sometimes generates implausibly long and erratic cycles. To preserve space, we do not report full estimation details, but results are available on request.

<u>FIGURE 2: CYCLES IN BUSINESS SECTOR GDP</u>

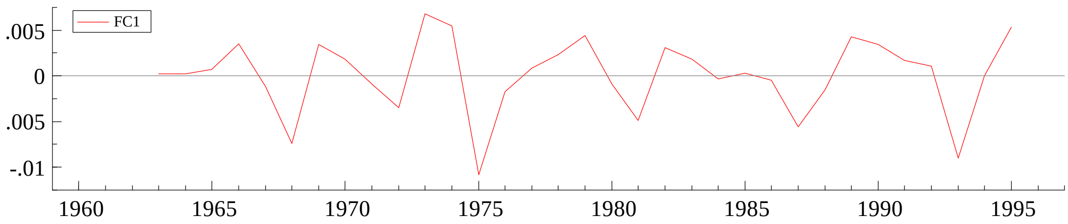
USA



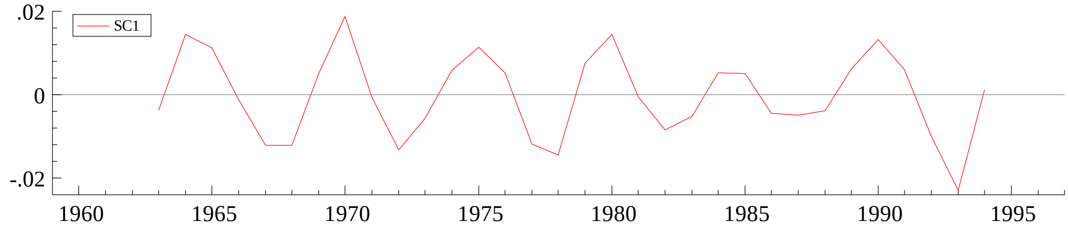
JAPAN



FRANCE



SWEDEN



trends are not simply linear. We adopt the relatively agnostic and parsimonious approach of attempting to capture trend behaviour through using a set of simple functions of T. We let S(T) take the form of a linear or quadratic or cubic function of T or a cubic spline with one knot, thereby allowing for fairly flexible but gradually evolving trended behaviour. In principle it might be desirable to allow for stochastic as well as deterministically trended behaviour, perhaps by estimating a structural time series model as discussed under 3(a) above. However, the restricted availability of annual participation rate data provides an insufficient span to enable discrimination among alternatives in such a framework. Instead, we select the best fitting deterministic function *S(T)* from a set of dynamic specifications which simultaneously estimate the impact of the cycle on participation rates.

In order to allow examination of the dynamic responses of participation rates to the cycle, we estimate dynamic regressions. The core equations are the same for females and males:

$$\Delta PR_{i,t} = m + \sum_{j=1}^{k} b_{ij} \Delta PR_{i,t-j} + \sum_{j=0}^{n} g_{ij} \Delta CY_{t-j} + h_i CY_{t-m} + aPR_{i,t-1} + S(T) + u_t \qquad (6)$$

where *PR* is the participation rate, *CY* is the cyclical component of business sector GDP, Δ is a difference operator, *S(T)* is a general deterministic function of time and *u* is a standard disturbance term. Subscript i refers to the particular age group.

As indicated earlier, we also wish to investigate whether participation responses to upward and downward shocks in business GDP relative to trend are in fact asymmetric. This possibility would, for example, allow a temporary downturn in GDP relative to trend to reduce the participation rate of a particular sub-group whilst an upturn may not fully correct the discouragement. The asymmetric specification includes additional terms $\Sigma d_j[DUM.CY]_{t-j}$ where *DUM* is defined to take the value 1 from the period following a peak in the *CY* variable until the trough and zero elsewhere. To the extent that the *DUM.CY* terms are statistically significant we have identified significant asymmetries.

Our estimation strategy combined single equation dynamic specification searches with the examination of system properties of SUR estimates. More specifically, the dynamic specifications were initially data determined on an equation-by-equation basis, using information from a full range of OLS diagnostics. The final specifications were then estimated by SUR on a country by country basis so that any cross correlations in residuals across age-groups within the same country were exploited to improve efficiency. Final choice was predicated on parsimony with the absence of serial correlation and heteroscedasticity. Our complete sets of SUR estimates of equation (6) and the asymmetric extension of (6) are included in the Appendix. We also report tests for the joint significance of the trend terms S(T), serial correlation, heteroscedasticity tests and, where appropriate, a Wald test which indicates the statistical significance of included asymmetric effects.

4. Estimated responses to shocks in business GDP

Based on the estimates of equation (6), Figure 3 shows the simulated participation responses for each of the four countries to a series of shocks to business sector GDP. Specifically, we observe responses of the participation rates to 1 percentage point changes in business sector GDP relative to trend. For each age group, we graph the responses as well as indicating some summary statistics. We report the peak participation response and, in the brackets immediately following each of these estimates, we record (a) the time taken to reach the peak, (b) the half-life[7], and (c) the length of time taken for participation to reach its long-run steady state. The half-life gives perhaps the best summary of the spread of adjustment response because the years preceding the estimated long-run steady state are often marked by extremely small adjustments.

There are three particularly interesting features of the Japanese responses in Figure 3. First, for each age group, the strongest responses to shocks in GDP occur in female participation; this is in marked contrast to males where only the oldest (55+) groups indicate any significant reaction.

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[7] This is the time taken (rounded to the nearest year) from the outset to reach the middle point between the shock occurring and reaching half way to the steady state or, in cases where adjustment overshoots the long run position, the time taken the time taken to reach half way between the "overshoot peak" and the steady state.

FIGURE 3: PARTICIPATION RATE RESPONSES TO INCREASES/DECREASES IN BUSINESS SECTOR GDP RELATIVE TO TREND

USA

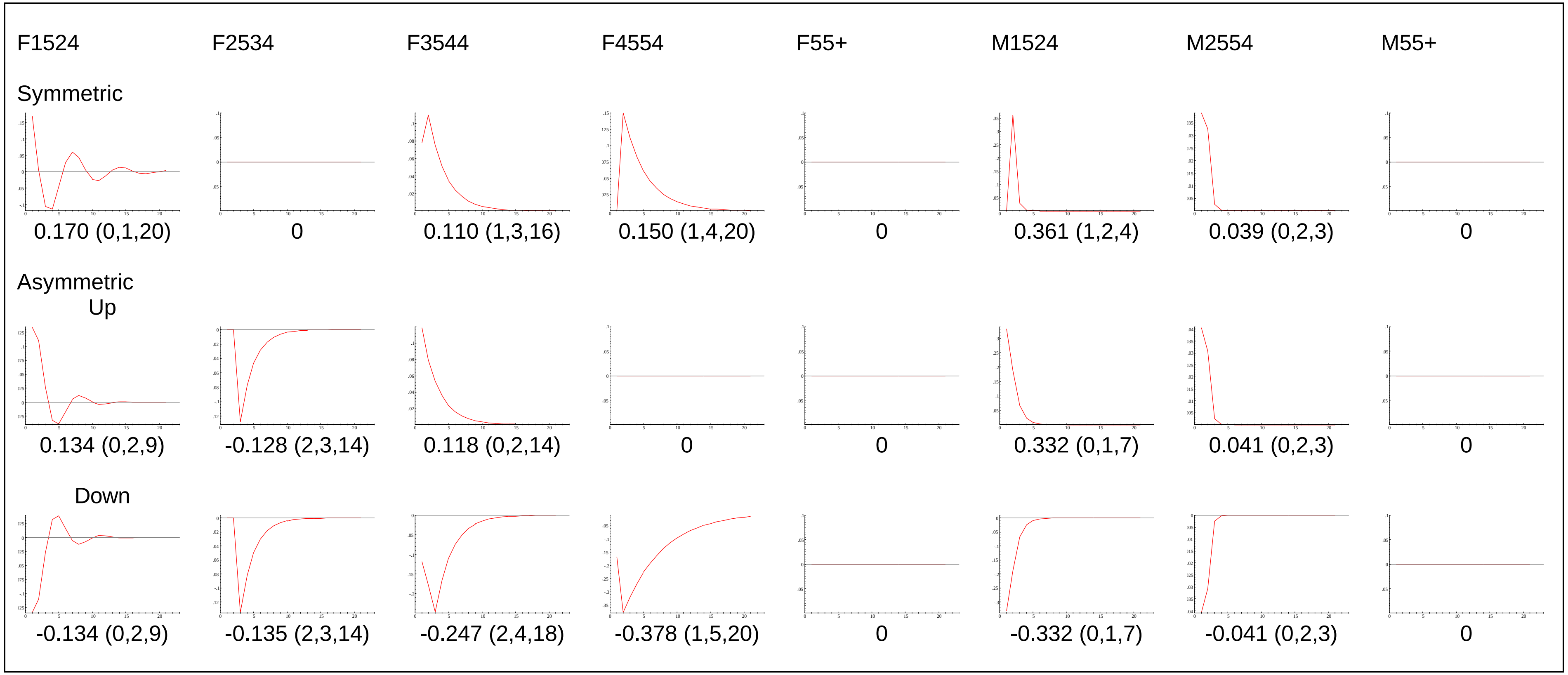


FIGURE 3 (CONT.)

JAPAN

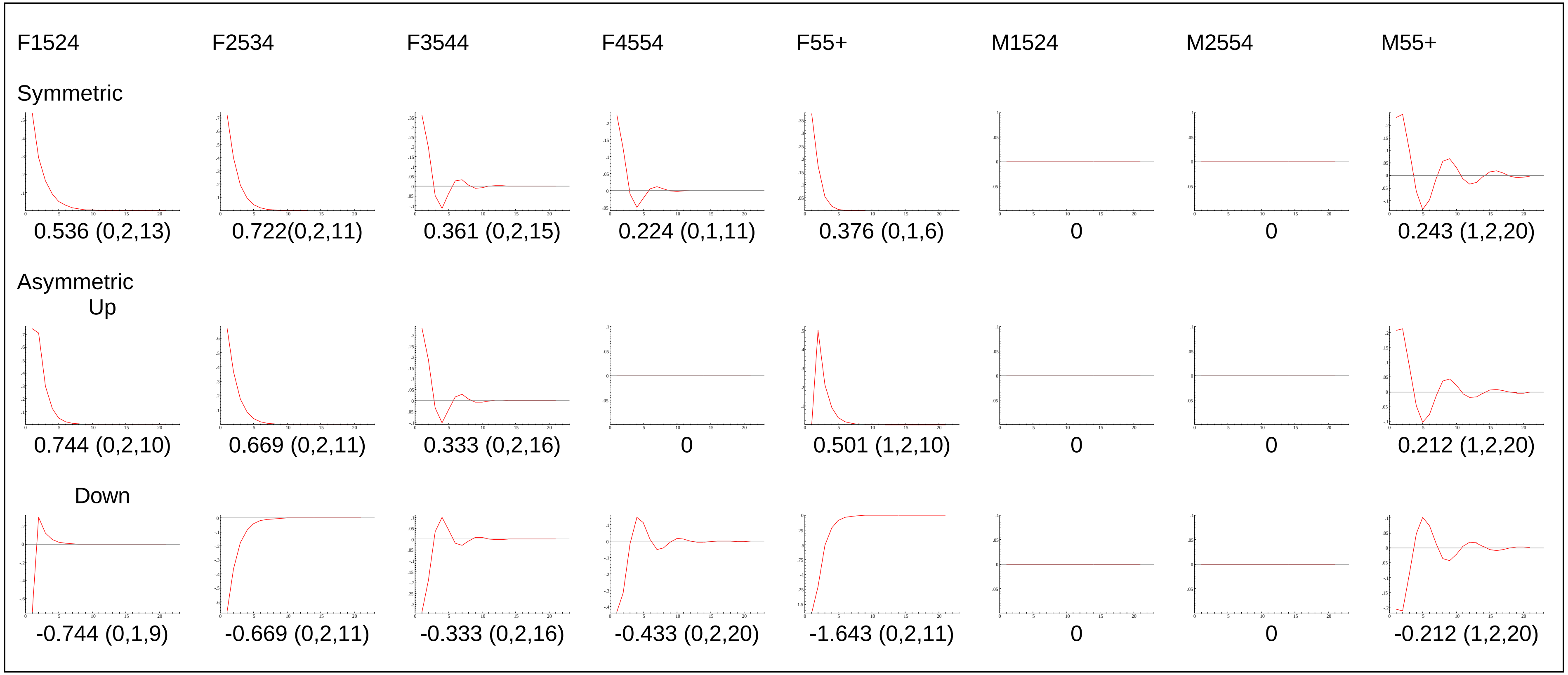


FIGURE 3 (CONT.)

SWEDEN

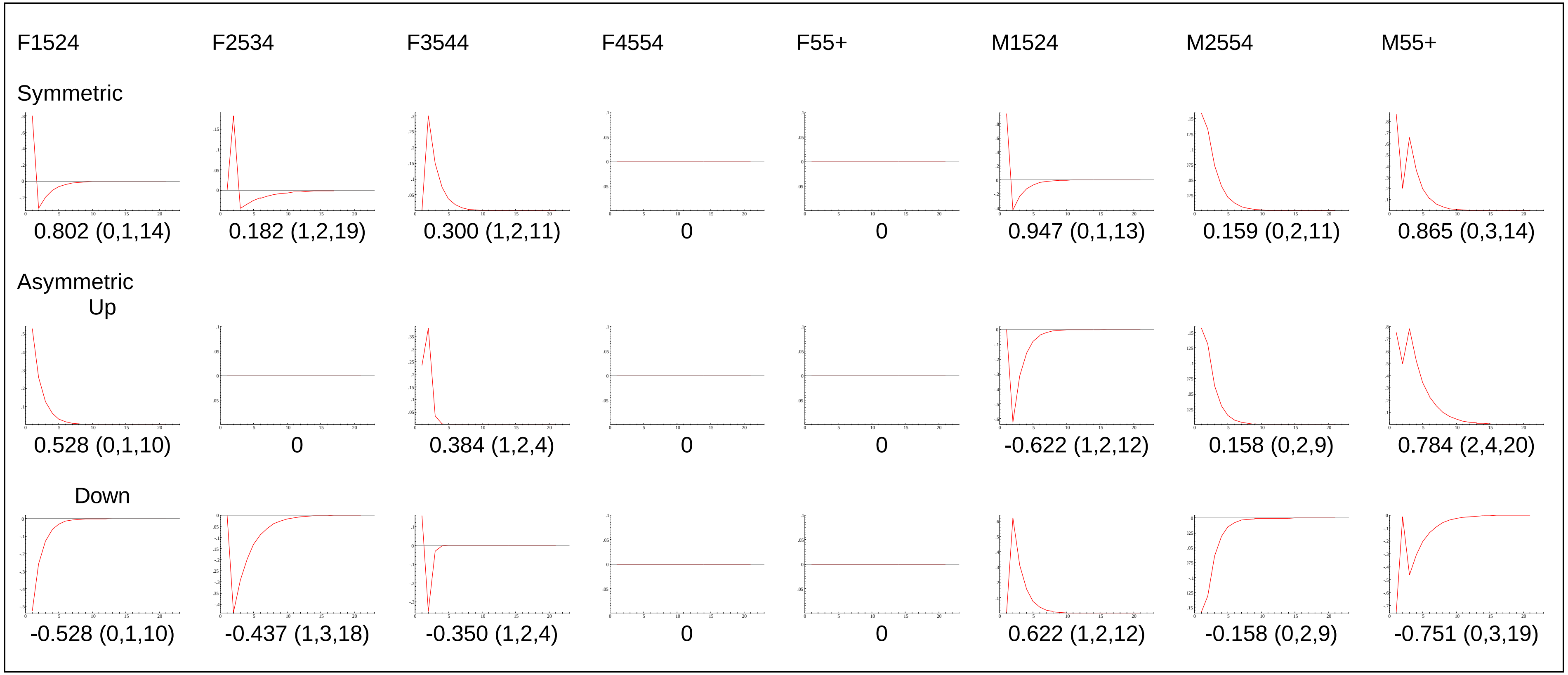
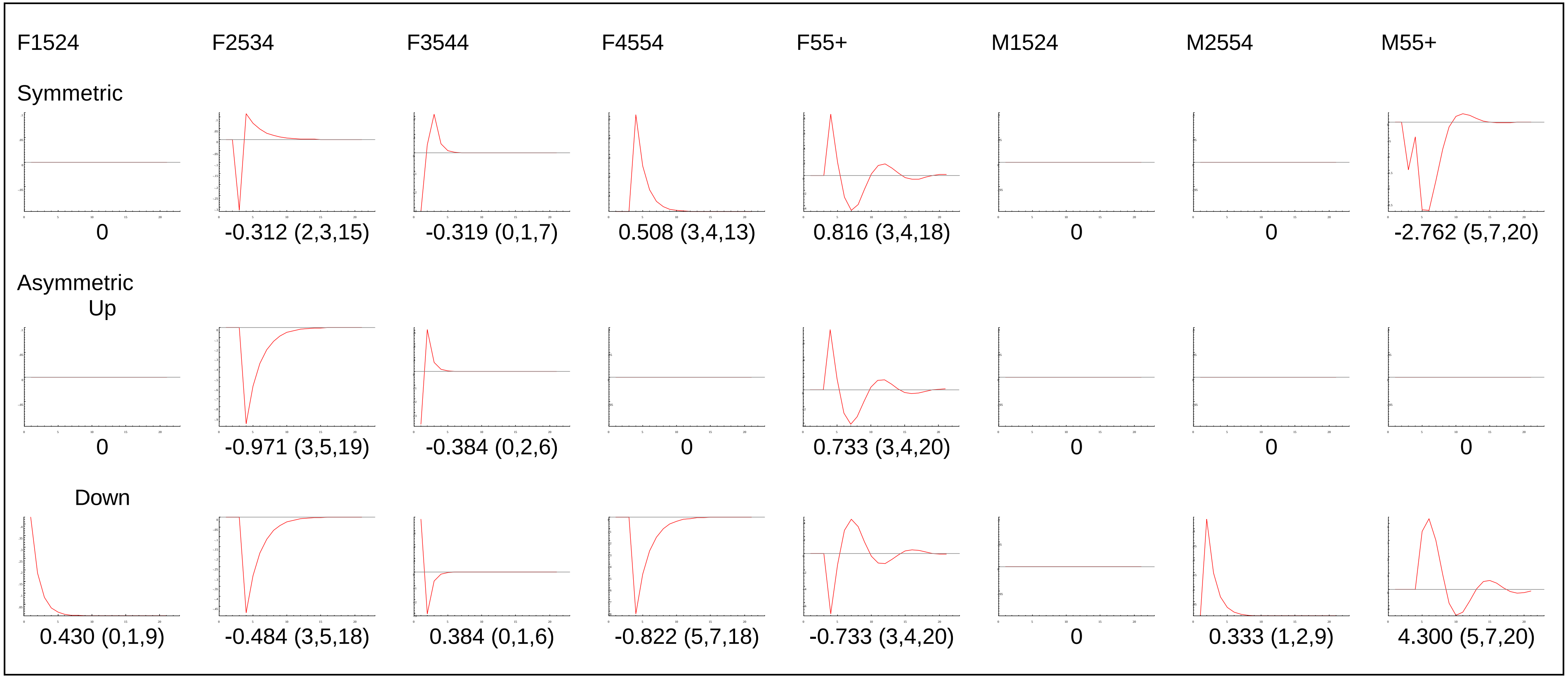


FIGURE 3 (CONT.)

FRANCE



Moreover, the size of this latter male adjustment is at the lower end of the spectrum of female responses. Secondly, for the three female age groups in the 15-44 age range, the asymmetric specification provides no evidence of significant asymmetries. They display half-lives of 2 years, although adjustment responses of about 0.6 percent among the younger age groups reduce to about 0.3 percent in middle-age. Thirdly, the two oldest female age groups - 45-54 and 55+ - exhibit significantly *asymmetric* responses; participation adjustments to negative shocks are much larger than the adjustments to positive shocks. In fact, in the case of the 45-54 group the estimated fall in participation which follows a downward shock contrasts with no adjustment in the upward direction. These latter findings are consistent with a discouraged worker effect in respect of older females. Note that for the equivalent males the participation response is both much smaller and symmetric. Thus, we corroborate the findings of Tachibanaki and Saskurai (1991) that the discouraged worker effect is essentially a female phenomenon in Japan and we further refine their analysis by indicating that this outcome is particularly prevalent among older females.

The relatively large responsiveness of Japanese female participation rates to business cycle shocks is a particularly interesting finding when set against the usual, almost stylised, facts about Japan's relatively sluggish labour stock adjustment (employment) on the one hand and flexible utilisation (hours of work) and price (wages and bonuses) adjustments on the other (e.g. Gordon, 1982; Hart and Malley, 1996). Employment stock measures usually ignore labour force participation and, clearly, the female results here do not fit well with the usual stories (human capital and others) that are built around the notion of employment stability. Our results are consistent with female employment in Japan being used as an important buffer to cyclical fluctuation[8]. By contrast, the unresponsiveness of male rates below the oldest working age group is far more in line with notions of employment stability and long-term employment contracts.

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[8] To a disproportionate extent, female workers in Japan are employed in non-regular jobs - such as temporary or seasonal jobs - an observation in line with our findings of a greater propensity for participation to react to cyclical fluctuations (Chalmers 1989).

The United States findings display major differences from those for Japan. First, U.S. participation rates of both females and males aged 55+ show no significant reactions to GDP shocks in sharp contrast to their Japanese equivalents. Second, participation rates of young U.S. males aged 15-24 are pro-cyclical and symmetric in comparison with the finding of no significant movements among comparable Japanese males. Third, young and middle-aged females are generally far less responsive to cyclical shocks than their Japanese counterparts. There is one interesting U.S./Japan similarity, however. Females aged 45-54 in the U.S. show reductions in participation in response to negative GDP shocks while there is no response to positive shocks. This funding of asymmetric behaviour is the same as found to the same as well as the older 55+ age group in Japan - and probably reflects a degree of permanent participation discouragement.

We earlier emphasised the seriousness of unemployment and particularly male unemployment in Europe. In several major countries, this has coincided with falls in male participation, particularly among older workers. In these respects, recent Swedish history fits the patterns well. Swedish male unemployment has risen and male participation fallen very significantly in the 1990s. Table 1b shows further that the largest drops in participation have occurred among both the youngest and the oldest male workers. Therefore, it is not surprising to find that, unlike Japan and the U.S., it is these male workers aged 55+ who, together with the 15-24 group, display the strongest overall participation responses to business cycle fluctuations. Interestingly, the response patterns for both young and old workers are symmetric. Among the latter group, however, the accompanying long adjustment lags - with half-lives of 3-4 years - suggest that even though the equations imply that participation rates are eventually restored back to their pre-1990s recessionary levels, the recovery will be slow. We should add that young Swedish females (15-24) also experience very large and symmetric participation adjustments, in line with their male contemporaries.

France has one of the worst European unemployment records for both females and males, with dramatic increases in rates throughout the 1980s and for the late 1990s[9]. The male unemployment picture is even more severe when male participation rates are accounted for over the same period: rates of around 82 percent in the early 1980s have reduced to around 74 percent by 1995. Like Sweden, Table 1b reveals that the youngest and oldest males have experienced the brunt of these latter declines. Perhaps not surprisingly against this backdrop, the French results in Figure 4 are the most complex to interpret. The largest negative impacts of business cycle fluctuations have been borne by females. The most clear-cut case is that of females aged 45-54. Here, the results are strong and consistent with worker discouragement, with a large downward participation response to negative shocks contrasting with no response on the upturn. The oldest female group (55+) also is very responsive to the business cycle but, perhaps surprisingly in this case, the estimates do not identify any significant asymmetry. However, the 4-year half-life reveals particularly slow adjustment among this latter group. Females aged 25-34 experience falls in participation resulting from *both* upward and downward shocks. Females aged 15-24 and, particularly, 35-44 display significant *counter*-cyclical participation responses. There are *no* French male responses to upward shocks. Another surprising result is that males in the middle- and oldest-age groups react *positively* to downward shocks. Combined with (most of) the female results, this latter finding may reflect a degree of substitution between male and female jobs during recessions.

A more general issue may also be relevant to the French findings. Structural influences may be especially important to this economy. Blanchard and Summers (1988) have stressed the strong hysteresis elements of French unemployment, which relates to labour market rigidity. If structural factors are the major determinants of labour force participation in this case, then it may be more difficult to discern strong and meaningful associations with the business cycle.

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[9] Both male and female unemployment rates have doubled since the early 1980s: the males rate has risen from about 7 to 14 percent and the female from about 4 to 9 percent.

There are two interesting general patterns in Figure 3, both of which relate to females. In the first place, we emphasised at the outset that we undertook a more detailed female age disaggregation in order to capture the strong possibility that participation rates at certain ages are likely to be strongly influenced by child rearing. We note that, with the exception of Japan, females aged 25-34 show either negative (United States and France) or zero (Sweden) response during *upturns* in the cycle. For all countries, negative responses occur among this female age group during downturns. This is strongly indicative of the possibility that leaving the labour force for family reasons constitutes an overriding response among this group.

Secondly, it is particularly noticeable that in France, Japan and the U.S. females aged 45-54 display large and asymmetric responses to cyclical shocks. Although other asymmetric cases exist, this age group and gender would appear to take the brunt of the “discouraged worker effect”.

6. Conclusions

It has long been recognised that international unemployment differences are incompletely represented by observing recorded unemployment rates alone. Suppose we define unemployment as an excess of hours of work supplied over those demanded at given wage levels. In this event, unemployment can occur both within as well as outside the workplace, a possibility long since recognised in the so-called labour hoarding literature. While Japan has enjoyed relatively low and stable recorded unemployment in the post-war era, it has also exhibited a relatively high propensity to hold excess stocks of labour during cyclical downturns (Hart and Malley, 1996; Vecchi, 1996).

A further important part of total excess hours supplied is so-called “hidden” unemployment which results from the fact that some workers do not officially register their available labour supply. In effect, they are discouraged from participating in the labour market. Failure to account for this aspect of excess supply might also serve to distort comparative international assessments of the incidence of unemployment. Outside of a full-scale and detailed questionnaire of non-participating individuals, it is not a simple task to separate discouraged worker effects from the totality of participation decisions. We are able to provide more insights in this direction because we devote considerable attention to measuring lengths and shapes of participation responses to business cycle shocks as well as testing for possible response asymmetries. We also show that disaggregating females and males by age group is an important aspect of determining where long-term labour force separations are taking place.

Why does our study serve further to modify impressions about comparative Japanese unemployment experience? We show quite unequivocally that Japanese female participation rates are strongly responsive to cyclical fluctuations. More importantly from an unemployment perspective, older Japanese female workers additionally display asymmetric responses to the fluctuations. These take the form of large downward participation adjustments to negative shocks contrasting with smaller, or zero, upward responses to positive shocks. The implied discouraged worker effects suggest that accounting for *both* recorded and hoarded unemployment in Japan would still underestimate the true comparative picture. Compared to the United States, for example, Japan reveals appreciably larger falls in female participation resulting from negative shocks.

The issue of labour force participation in relation to the business cycle is perhaps more crucial to European policy makers. Over much of the 1980s and 1990s, not only has European recorded unemployment been significantly higher than in Japan or the U.S. but problems of long-term unemployment and youth unemployment have been far more acute. Our two representative countries illustrate the problems, although they have a somewhat shorter and more recent history in the case of Sweden. A serious recorded unemployment problem is exacerbated much further by the sharp decline in European male participation rates. Our evidence on cycles, however, adds more interesting detail. For countries like Sweden, there may be room for cautious optimism. While we find large pro-cyclical responses of participation to cyclical shocks, the responses are symmetric. We may therefore be witnessing sluggish downward participation rate adjustments to cyclical downturns that will gradually return to former levels as the cycle turns up. The French example is more serious, however. There is evidence of serious female employment problems, due to both participation discouragement and to substitution of male for female jobs. In general, however, the French participation responses to the cycle are more difficult to interpret compared to the other countries. It could be that structural influences in this economy are so overwhelmingly important that meaningful cyclical participation responses, at least for some age groups, are difficult to detect.

Finally, and perhaps most importantly, the discouraged worker effect is essentially a female phenomenon. Asymmetric adjustments - with falls in participation during cyclical downturns being significantly larger than the rises during upturns - occurs only among females. Such adjustments are particularly prevalent among 45 to 54 year old females.

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RESULTS APPENDIX

Notes for Appendix tables:

1. The estimation method is SUR and the sample period in all cases is 1972-1995. The estimation was carried out using TSP version 4.4.

2. Standard errors are reported in parenthesis, underneath the estimated parameters.

3. Probablility values for the diagnostic tests are reported in square brackets, underneath the values of the test statistics.

4. The estimated parameters on the trend regressors are not reported to save space. Instead a single diagnostic appears for each equation indicating the joint significance of the trend or spline regressors, these tests are standard Wald tests.

5. The serial correlation tests are LM tests performed on the SUR residuals by auxiliary regression.

6. The heteroscedasticity tests result from a regression in which the squared SUR residuals are regressed on a constant and the squared fitted values.

Appendix table 1 - USA Symmetric

	F15-24	**F25-34**	**F35-44**	**F45-54**	**F55+**	**M15-24**	**M25-54**	**M55+**
C	0.327 (0.059)	0.354 (0.053)	0.159 (0.024)	0.137 (0.063)	0.235 (0.066)	0.655 (0.079)	0.875 (0.147)	0.411 (0.114)
PR(-1)	-0.631 (0.119)	-0.775 (0.123)	-0.316 (0.051)	-0.256 (0.115)	-0.564 (0.153)	-0.920 (0.115)	-0.917 (0.153)	-0.518 (0.138)
DPR(-1)	0.664 (0.123)							
CY(-1)			0.134 (0.038)	0.150 (0.048)		0.361 (0.066)	0.068 (0.019)	
DCY	0.170 (0.032)		0.078 (0.029)				0.039 (0.015)	
R-Squared:	0.802	0.897	0.883	0.668	0.662	0.740	0.732	0.630
Wald test for joint significance of trend/spline terms								
Test stat. P_value	χ^2(2)=18.68 [.000]	χ^2(4)=65.64 [.000]	χ^2(2)=114.32 [.000]	χ^2(3)=43.09 [.000]	χ^2(2)=36.61 [.000]	χ^2(2)=17.56 [.000]	χ^2(3)=72.31 [.000]	χ^2(2)=8.86 [.012]
LM tests for Serial Correlation								
F(1,21) P_value	0.105 [.749]	0.857 [.365]	0.370 [.549]	0.616 [.441]	0.039 [.846]	3.755 [.066]	0.062 [.806]	0.011 [.919]
F(2,20) P_value	0.293 [.749]	0.410 [.669]	0.246 [.784]	0.481 [.625]	0.202 [.819]	2.377 [.117]	1.110 [.348]	0.032 [.969]
LM test for Heteroscedasticity								
F(1,21) P_value	1.117 [.290]	1.654 [.198]	0.541 [.462]	0.089 [.766]	1.043 [.307]	1.039 [.308]	5.779 [.016]	0.023 [.879]

Appendix table 2 - USA Asymmetric

	F15-24	F25-34	F35-44	F45-54	F55+	M15-24	M25-54	M55+
C	0.345	0.189	0.166	0.081	0.208	0.462	0.879	0.382
	(0.046)	(0.042)	(0.021)	(0.028)	(0.066)	(0.065)	(0.145)	(0.112)
PR(-1)	-0.660	-0.395	-0.330	-0.157	-0.500	-0.645	-0.922	-0.484
	(0.092)	(0.099)	(0.044)	(0.056)	(0.154)	(0.093)	(0.151)	(0.135)
DPR(-1)	0.486							
	(0.098)							
DCY						0.332	0.041	
						(0.046)	(0.015)	
CY	0.134		0.119					
	(0.057)		(0.031)					
CY(-1)						0.402	0.068	
						(0.066)	(0.019)	
CY(-2)		-0.128						
		(0.047)						
DUM.CY				0.167				
				(0.061)				
DUM.CY(-1)			0.098	0.237				
			(0.039)	(0.058)				
DUM.CY(-2)		0.263	0.129					
		(0.060)	(0.037)					
R-squared	0.793	0.912	0.906	0.723	0.658	0.829	0.731	0.631
Wald test for joint significance of trend/spline terms								
Test stat.	$\chi^2(2)$=32.24	$\chi^2(3)$=46.81	$\chi^2(2)$=144.95	$\chi^2(2)$=47.45	$\chi^2(2)$=32.63	$\chi^2(3)$=64.66	$\chi^2(3)$=73.31	$\chi^2(2)$=7.80
P_value	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.020]
Wald test for joint significance of asymmetric terms $S_i DUM.CY_{t-i}$								
Test stat.	n-a	$\chi^2(1)$=19.099	$\chi^2(2)$=15.053	$\chi^2(2)$=19.730	n-a	n-a	n-a	n-a
P_value		[.000]	[.000]	[.000]				
LM tests for Serial Correlation								
F(1,21)	1.173	0.301	0.082	0.048	0.000	0.635	0.062	0.063
P_value	[.291]	[.589]	[.777]	[.828]	[.998]	[.434]	[.806]	[.805]
F(2,20)	0.768	0.435	0.322	0.248	0.226	0.593	0.957	0.051
P_value	[.477]	[.653]	[.729]	[.782]	[.799]	[.561]	[.400]	[.951]
LM test for Heteroscedasticity								
F(1,21)	0.126	2.062	0.048	0.072	1.352	0.334	5.761	0.044
P_value	[.723]	[.151]	[.826]	[.788]	[.245]	[.563]	[.016]	[.835]

Appendix table 3 - Japan Symmetric

	F15-24	F25-34	F35-44	F45-54	F55+	M15-24	M25-54	M55+
C	0.207	0.215	0.528	0.491	0.204	0.161	0.753	0.436
	(0.052)	(-0.513)	(0.063)	(0.093)	(0.026)	(0.051)	(0.160)	(0.073)
PR(-1)	-0.438		-0.885	-0.804	-0.691	-0.296	-0.769	-0.634
	(0.098)		(0.104)	(0.153)	(0.085)	(0.080)	(0.163)	(0.103)
DPR(-1)			0.434	0.357		0.448		0.685
			(0.083)	(0.133)		(0.076)		(0.112)
CY			0.361	0.224				0.231
			(0.102)	(0.100)				(0.087)
CY(-1)	0.527	0.771			0.434			
	(0.204)	(0.195)			(0.117)			
DCY	0.536	0.722			0.376			
	(0.161)	(0.133)			(0.096)			
R-squared	0.759	0.721	0.751	0.649	0.602	0.885	0.371	0.654
Wald test for joint significance of trend/spline terms								
Test stat.	$\chi^2(2)$= 23.87	$\chi^2(1)$= 51.10	$\chi^2(4)$= 104.4	$\chi^2(3)$= 63.77	$\chi^2(1)$= 3.108	$\chi^2(2)$= 13.87	$\chi^2(2)$= 12.91	$\chi^2(2)$=24.53
P_value	[.000]	[.000]	[.000]	[.000]	[.078]	[.000]	[.002]	[.000]
LM tests for Serial Correlation								
F(1,21)	0.156	0.290	0.691	1.230	3.186	0.625	0.006	0.106
P_value	[.696]	[.596]	[.415]	[.280]	[.089]	[.438]	[.937]	[.748]
F(2,20)	0.273	1.389	0.501	0.598	1.716	0.305	0.157	0.116
P_value	[.764]	[.272]	[.613]	[.559]	[.205]	[.740]	[.855]	[.891]
LM test for Heteroscedasticity								
F(1,21)	0.217	2.077	0.116	0.001	1.292	1.071	0.056	0.116
P_value	[.641]	[.150]	[.734]	[.981]	[.256]	[.301]	[.812]	[.724]

Appendix table 4 - Japan Asymmetric

	F15-24	F25-34	F35-44	F45-54	F55+	M15-24	M25-54	M55+
C	0.276	0.216	0.509	0.469	0.174	0.175	0.668	0.419
	(0.049)	(0.033)	(0.077)	(0.098)	(0.025)	(0.047)	(0.170	(0.060)
PR(-1)	-0.584	-0.516	-0.856	-0.766	-0.576	-0.321	-0.682	-0.612
	(0.095)	(0.080)	(0.125)	(0.161)	(0.084)	(0.076)	(0.173)	(0.085)
DPR(-1)			0.428	0.498		0.439		0.634
			(0.105)	(0.142)		(0.074)		(0.093)
DCY		0.669	0.333					
		(0.126)	(0.102)					
CY	0.744							0.208
	(0.165)							(0.073)
CY(-1)	0.402	0.712			0.501			
	(0.178)	(0.190)			(0.102)			
DUM.CY				0.433	1.643			
				(0.233)	(0.286)			
DUM.CY(-1)	-1.010							
	(0.373)							
R-Squared:	0.799	0.716	0.747	0.655	0.618	0.882	0.370	0.640
Wald test for joint significance of trend/spline terms								
Test stat.	$\chi^2(2)$=39.92	$\chi^2(1)$= 48.89	$\chi^2(4)$= 81.99	$\chi^2(3)$= 39.36	n-a	$\chi^2(2)$=15.24	$\chi^2(2)$=8.83	$\chi^2(2)$=34.35
P_value	[.000]	[.000]	[.000]	[.000]		[.000]	[.012]	[.000]
Wald test for joint significance of asymmetric terms $S_i DUM.CY_{t-i}$								
Test stat.	$\chi^2(1)$=7.319	n-a	n-a	$\chi^2(1)$=3.460	$\chi^2(1)$=32.95	n-a	n-a	n-a
P_value	[.007]			[.063]	[.000]			
LM tests for Serial Correlation								
F(1,21)	0.265	0.514	0.663	0.010	3.077	0.208	0.082	0.057
P_value	[.612]	[.481]	[.425]	[.922]	[.094]	[.653]	[.778]	[.813]
F(2,20)	0.374	1.850	0.491	0.044	1.473	0.152	0.175	0.170
P_value	[.693]	[.183]	[.619]	[.957]	[.253]	[.860]	[.841]	[.845]
LM test for Heteroscedasticity								
F(1,21)	0.070	2.027	0.066	0.009	1.365	0.472	0.000	0.135
P_value	[.791]	[.154]	[.798]	[.926]	[.243]	[.492]	[.990]	[.713]

Appendix table 5 - France Symmetric

	F15-24	F25-34	F35-44	F45-54	F55+	M15-24	M25-54	M55+
C	0.240	0.218	0.368	0.275	0.144	0.314	0.704	0.214
	(0.074)	(0.065)	(0.051)	(0.069)	(0.031)	(0.080)	(0.168)	(0.061)
PR(-1)	-0.522	-0.366	-0.767	-0.527	-0.403	-0.551	-0.726	-0.336
	(0.161)	(0.124)	(0.110)	(0.136)	(0.082)	(0.137)	(0.173)	(0.080)
DPR(-1)					0.620			0.413
					(0.117)			(0.104)
CY(-3)				0.508				-3.205
				(0.205)				(0.870)
DCY			-0.318					
			(0.066)					
DCY(-1)			-0.202					
			(0.070)					
DCY(-2)		-0.312						-1.490
		(0.151)						(0.451)
DCY(-3)					0.817			2.859
					(0.222)			(0.446)
R-Squared:	0.586	0.688	0.850	0.529	0.675	0.355	0.340	0.774
Wald test for joint significance of trend/spline terms								
Test stat.	$\chi^2(2)$=17.93	$\chi^2(2)$=5.38	$\chi^2(2)$=52.95	$\chi^2(2)$=17.36	$\chi^2(3)$=20.76	$\chi^2(2)$=18.06	$\chi^2(1)$=18.32	$\chi^2(4)$=30.62
P_value	[.000]	[.068]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]
LM tests for Serial Correlation								
F(1,22)	0.208	1.482	0.261	0.242	1.131	0.007	0.537	1.287
P_value	[.653]	[.236]	[.615]	[.627]	[.299]	[.935]	[.471]	[.269]
F(2,21)	0.225	0.708	0.809	2.074	0.576	0.009	0.259	0.866
P_value	[.801]	[.504]	[.459]	[.151]	[.571]	[.991]	[.774]	[.435]
LM test for Heteroscedasticity								
F(1,21)	3.049	0.136	1.698	0.036	0.030	0.047	0.874	0.005
P_value	[.081]	[.712]	[.193]	[.850]	[.863]	[.829]	[.350]	[.944]

Appendix table 6 - France Asymmetric

	F15-24	**F25-34**	**F35-44**	**F45-54**	**F55+**	**M15-24**	**M25-54**	**M55+**
C	0.259 (0.061)	0.230 (0.063)	0.377 (0.054)	0.216 (0.080)	0.149 (0.031)	0.569 (0.094)	0.540 (0.141)	
PR(-1)	-0.567 (0.133)	-0.386 (0.119)	-0.786 (0.116)	-0.408 (0.158)	-0.414 (0.082)	-0.949 (0.154)	-0.558 (0.145)	0.281 (0.064)
DPR(-1)					0.602 (0.118)			-0.420 (0.088)
DCY			-0.385 (0.072)					
DCY(-1)			-0.247 (0.082)				0.186 (0.083)	
DCY(-3)					0.733 (0.216)			
CY(-3)		-0.971 (0.391)						
DUM.CY	-0.430 (0.160)							0.636 (0.111)
DUM.CY(-1)							-0.333 (0.100)	
DUM.CY(-3)		1.454 (0.474)		0.822 (0.249)				
DUM.CY(-4)								-3.535 (0.582)
R-squared	0.660	0.678	0.836	0.550	0.664	0.616	0.440	0.733
Wald test for joint significance of trend/spline terms								
Test stat.	$\chi^2(2)$=26.84	$\chi^2(2)$=6.16	$\chi^2(3)$=52.69	$\chi^2(2)$=10.19	$\chi^2(3)$=20.97	$\chi^2(4)$=49.28	$\chi^2(1)$=13.94	$\chi^2(3)$=21.22
P_value	[.000]	[.046]	[.000]	[.006]	[.000]	[.000]	[.000]	[.000]
Wald test for joint significance of asymmetric terms $S_i DUM.CY_{t-i}$								
Test stat.	$\chi^2(1)$=7.210	$\chi^2(1)$=9.432	n-a	$\chi^2(1)$=10.926	n-a	n-a	$\chi^2(1)$=11.205	$\chi^2(1)$=36.905
P_value	[.007]	[.002]		[.000]			[.000]	[.000]
LM tests for Serial Correlation								
F(1,21)	0.822	0.665	0.468	0.306	0.598	0.065	0.086	2.238
P_value	[.375]	[.424]	[.501]	[.586]	[.448]	[.801]	[.773]	[.150]
F(2,20)	0.581	0.317	1.375	1.253	0.288	0.274	0.041	1.157
P_value	[.569]	[.732]	[.276]	[.307]	[.753]	[.763]	[.960]	[.335]
LM test for Heteroscedasticity								
F(1,21)	3.014	1.376	1.377	0.633	0.037	0.006	2.451	0.016
P_value	[.083]	[.241]	[.241]	[.426]	[.847]	[.940]	[.117]	[.901]

Appendix table 7 - Sweden Symmetric

	F15-24	F25-34	F35-44	F45-54	F55+	M15-24	M25-54	M55+
C	0.223 (0.051)	0.156 (0.032)	0.347 (0.087)	0.454 (0.079)	0.338 (0.069)	0.283 (0.054)	0.420 (0.113)	0.373 (0.091)
PR(-1)	-0.412 (0.093)	-0.244 (0.056)	-0.504 (0.132)	-0.677 (0.124)	-0.769 (0.169)	-0.451 (0.089)	-0.451 (0.121)	-0.452 (0.107)
DPR(-1)					0.450 (0.143)			
CY(-1)			0.300 (0.088)				0.205 (0.054)	1.138 (0.156)
DCY	0.802 (0.196)					0.947 (0.162)	0159 (0.048)	0.865 (0.108)
DCY(-1)		0.182 (0.057)						-0.548 (0.112)
R-Squared:	0.826	0.748	0.837	0.907	0.684	0.874	0.876	0.863
Wald test for joint significance of trend/spline terms								
Test stat. P_value	$\chi^2(4)$=93.79 [.000]	$\chi^2(2)$=222.86 [.000]	$\chi^2(2)$=52.37 [.000]	$\chi^2(2)$=78.25 [.000]	$\chi^2(3)$=34.11 [.000]	$\chi^2(4)$=105.18 [.000]	$\chi^2(4)$=66.84 [.000]	$\chi^2(4)$=40.48 [.000]
LM tests for Serial Correlation								
F(1,21) P_value	0.338 [.567]	0.196 [.662]	0.163 [.690]	0.237 [.632]	0.222 [.642]	0.016 [.900]	0.039 [.845]	0.560 [.462]
F(2,20) P_value	0.214 [.809]	0.234 [.794]	0.214 [.809]	1.453 [.257]	1.250 [.308]	1.524 [.242]	2.165 [.141]	0.512 [.607]
LM test for Heteroscedasticity								
F(1,21) P_value	0.146 [.702]	1.685 [.194]	0.631 [.427]	0.757 [.384]	2.727 [.099]	0.184 [.668]	0.810 [.368]	1.014 [.314]

Appendix table 8 - Sweden Asymmetric

	F15-24	F25-34	F35-44	F45-54	F55+	M15-24	M25-54	M55+
C	0.281	0.206	0.630	0.418	0.341	0.321	0.481	0.277
	(0.055)	(0.042)	(0.083)	(0.083)	(0.064)	(0.077)	(0.107)	(0.073)
PR(-1)	-0.510	-0.330	-0.911	-0.621	-0.772	-0.499	-0.515	-0.338
	(0.102)	(0.073)	(0.123)	(0.129)	(0.148)	(0.127)	(0.115)	(0.085)
DPR(-1)					0.380			
					(0.130)			
DCY							0.158	
							(0.050)	
DCY(-1)						0.728		
						(0.225)		
CY	0.529		0.237					0.751
	(0.211)		(0.099)					(0.067)
CY(-1)			0.363			-0.622	0.213	
			(0.067)			(0.250)	(0.061)	
CY(-2)								0.455
								(0.073)
DUM.CY			-0.393					
			(0.122)					
DUM.CY(-1)		0.437						-0.484
		(0.121)						(0.092)
R-squared	0.806	0.937	0.942	0.907	0.682	0.807	0.877	0.899
Wald test for joint significance of trend/spline terms								
Test stat.	$\chi^2(4)$=3.16	$\chi^2(2)$=179.74	$\chi^2(3)$=163.86	$\chi^2(2)$=73.03	$\chi^2(3)$=41.09	$\chi^2(4)$=63.96	$\chi^2(4)$=79.39	$\chi^2(4)$=67.21
P_value	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]
Wald test for joint significance of asymmetric terms $S_i DUM.CY_{t-i}$								
Test stat.	n-a	$\chi^2(1)$=13.095	$\chi^2(1)$=10.405	n-a	n-a	n-a	n-a	$\chi^2(1)$=27.434
P_value		[.000]	[.000]					[.000]
LM tests for Serial Correlation								
F(1,21)	0.078	0.943	0.928	0.510	0.495	0.254	0.000	0.681
P_value	[.783]	[.343]	[.591]	[.483]	[.489]	[.620]	[.995]	[.419]
F(2,20)	0.038	1.740	1.410	1.947	1.564	1.806	1.923	1.021
P_value	[.963]	[.201]	[.267]	[.169]	[.234]	[.190]	[.172]	[.378]
LM test for Heteroscedasticity								
F(1,21)	4.975	3.194	1.295	0.669	2.694	7.828	0.825	0.251
P_value	[.026]	[.074]	[.255]	[.414]	[.101]	[.805]	[.364]	[.616]