

# The Impact of the US and Japanese Economies on Korea and Malaysia after the Plaza Accord

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This paper investigates the influence of the US and Japanese macroeconomic shocks on output in Korea and Malaysia before and after the Plaza Accord. This is done by using a cointegration/error-correction model in seven variables, consisting of world oil price, US and Japanese outputs and money supplies, domestic money and domestic output. Our results show that foreign shocks account for a higher proportion of output variability in Korea and Malaysia after the Plaza Accord. An interesting finding is that the influence of the US economy on Korea and Malaysia has declined while the Japanese influence has increased.

## I. Introduction

Over the last decade, East Asia has become one of the fastest growing regions in the world.<sup>1</sup> This is due to the rapid expansion of intraregional trades and flows of foreign direct investments. Japan has also become the major trader and investor in this region. As Kwan (1994) notes, the Asian countries have diversified their exports and traded more among themselves. This is due to the trade friction between nations across the Pacific and a declining US economy. As a consequence, Japanese foreign direct investment has increased in this region whereas that of the US has declined. Moreover, the Asian NICs, have also emerged as major investors in the region. This trend has become more apparent since the Plaza

1. In this study, East Asia refers to the Asian Newly Industrialized Countries (NICs) and four members of the Association of Southeast Asia Nations (ASEAN). Asian NICs include Hong Kong, Korea, Taiwan and Singapore. ASEAN countries included are Indonesia, the Philippines, Thailand and Malaysia. But not Singapore and Brunei which are also members of ASEAN.

Accord of 1985, in which finance ministers from five major industrialized countries agreed to realign their exchange rates simultaneously.<sup>2</sup> The purpose of this global exchange rate realignment was to reduce global trade imbalances, especially between the US and Japan. As a result, the Japanese yen began to appreciate against the dollar, the appreciation amounting to 61% between September 1985 and September 1988. Japanese multinational firms, realizing that their exports were deteriorating, carried out a massive reallocation of their firms and manufacturing capacity towards neighbouring ASEAN countries such as Malaysia, Indonesia and Thailand (see, e.g., Ying, 1990; Yamazawa et al., 1991; Kwan, 1994). The abundance of natural resources and relatively cheaper labour in these countries provided Japanese firms with lower production costs and an export platform.

The initial appreciation of the yen has also been beneficial for the Asian NICs. Their exports to the US and other industrialized countries became more competitive compared to Japan's. Their terms of trade with the US improved and their trade surplus began to rise. However, this did not last long. Increasing pressure from the US to revalue their currencies and the removal of special tariff treatment in 1989 eventually caused their trade surplus to decline. Like Japan, many Asian NIC's firms began to relocate their production to neighbouring ASEAN countries in order to maintain their competitiveness.

The importance of Japan's economic influence on East Asia has prompted many studies in the areas of economic and financial integration in this region. Some of these studies (e.g., Frankel, 1993; Frankel and Wei, 1994; Goto and Hamada, 1994; Ito, 1994) have focused on the possibility of the formation of a new economic bloc centred on a Japan – yen bloc. However, the term 'yen bloc' is interpreted differently by different economists and policy makers. First, it is typically interpreted to mean a free-trade area or a tariff union where members are given preferential treatment compared to non-members. This is somewhat similar to the former European Community (EC) and the North American Free Trade Area (NAFTA). The second interpretation is centred on the role the yen plays as an international currency where international transaction and invoicing are done using the yen (e.g., Ito, 1992; Aggarwal and Mougoué, 1993; Taguchi, 1994; Melvin et al., 1994). This is the Asian version of the European Monetary System where, according to some views, the Deutsche Mark is the anchor currency. Other studies concentrate on the capital mobility and the comovement of the interest rates in the region. Glick and Hutchison (1990) and Chinn and Frankel (1994) found increasing comovement of real interest rates among the Asian countries. In a more recent paper, Chinn and Frankel (1995) investigate the US and Japanese influence on real interest rates in East Asia (the NICs, Indonesia, Malaysia and Thailand) using cointegration analysis.

2. Held at the Plaza Hotel in New York on 22 September, 1985 between the G-5 countries, Britain, France, West Germany, Japan and the United States. See Kreinin (1991, p. 206) and Cohen (1993) for a succinct discussion.

Nevertheless, the number of empirical studies on the effect of foreign shocks in this region has been limited. This paper investigates the influence of the US and Japan's macroeconomic shocks on the output of South Korea (henceforth Korea) and Malaysia. We are particularly interested in the effect of these shocks before and after the appreciation of the yen in 1985. Towards this goal we have used vector autoregressive (VAR) models along with the cointegrating technique.

We chose Korea and Malaysia in our study for two reasons: First, Korea and Malaysia represent two groups of countries in East Asia with different stages of economic development. These are the NICs and the ASEAN countries which are also called Newly Exporting Countries (NECs). Korea and the other NICs have a trade structure that resembles Japan. They compete with Japan for export markets in the US and other developing countries in the region. At the same time, these countries have the same problem in managing the economic transition from low-wage capital-intensive manufacturing to high-wage capital-intensive manufacturing that competes with other countries on product design and innovation. On the other hand, Malaysia and some other NECs with plentiful natural resources are making the transition from a natural resources-based economy toward a labour-intensive manufacturing economy. The second reason for choosing Korea and Malaysia is the availability of data. Monthly data from 1974 to 1995 give us enough observations to compare the influence of the US and Japan over two different periods.

The paper is organized as follows. In Section II, we briefly compare the Malaysian and Korean economies. The methodology and the model are discussed in Section III and the stationarity long-run properties of the data in Section IV. Section V summarizes the empirical findings regarding the effects of foreign and domestic shocks. Concluding remarks are presented in Section VI.

## **II. Comparison of Malaysian and Korean Economies**

The business cycle of an individual small open economy is influenced in some way by its principal trading partners, especially when the trading partners have much larger economies. Both Korea and Malaysia are small open economies which have relied heavily on the US and Japan for exports and imports, foreign direct investment and technology. We assume that any fluctuation in the larger trading partner's economy will affect the smaller country's trade balance and current account. The extent to which foreign shocks affect these small countries depends on the degree of openness of the economy, the degree of integration between domestic and foreign financial markets, and the country's exchange rate policy.

The expansion of trading activities by Korea and Malaysia in the 1980s is due to changes in the commodity structure of trade. The Malaysian economy which relied heavily on the exports of primary commodities is now aggressively promoting exports of labour-intensive manufactured goods. The share of manufactured goods in total exports has increased from 3% in 1963 to 41% in 1988.

Korea with few natural resources was also able to increase the share of its manufactured goods from 46% of total exports to 92% over the same period (Noland, 1990, p. 2). On the import side, Korea and Malaysia relied on the US and Japan as their main suppliers of capital and technology. However, the percentage of exports and imports in their gross domestic products differ between these two countries. Malaysian export- and import-GDP ratios have doubled since 1985 (see Table 1).

**Table 1 Export and Import Shares**

	1970	1979	1982	1985	1988	1991	1994
A. Export/GDP ratios							
Korea	9.5	23.3	29.3	32.1	33.3	24.4	25.3
Malaysia	42.5	52.1	44.9	49.0	60.8	72.9	82.9
B. Import/GDP ratios							
Korea	22.6	31.4	32.6	33.0	28.5	27.7	27.0
Malaysia	35.3	37.0	46.4	39.4	47.6	77.8	84.1

Source: International Monetary Fund, *International Financial Statistics, Yearbook*, 1995.

The high levels of export- and import-GDP ratios reflect the importance of trade in Malaysian economic growth. At the same time, it also means that the economy in Malaysia is more vulnerable to developments in its trading partners' economies. Korean export- and import-GDP ratios increased slightly during the yen appreciation but declined after 1990 because of an increase in the size of the domestic economy.

Equally important are the liberalization of domestic financial system and the relaxation of restrictions on international capital flows. According to Glick (1988) and Glick and Hutchinson (1990), financial market liberalization began in the 1970s in Malaysia but not until the early 1980s in Korea. This includes reduction in interest rate controls, credit allocation regulations and capital controls. However, the degree of liberalization between Korean and Malaysian financial markets varies. Malaysia has allowed market forces to determine its level of interest rates but the Korean government still maintains some control, especially over bank deposit interest rates. Both countries still maintain some degree of control over credit, but direct credit controls and preferential rates for specific industries have been removed.<sup>3</sup> Currently, there are no restrictions on international capital flows in Malaysia except those introduced after the recent Asian financial crisis, but some restrictions continue to exist in Korea.

The exchange rates of both Korean and Malaysian currencies are pegged to a basket of principal trading partners' currencies. This type of exchange-rate

3. For many years, Korean and Malaysian governments have used domestic credit control to finance many unsuccessful heavy industry and capital-intensive projects (see, e.g., Noland 1990; Jwa 1994). This intervention resulted in financial crowding-out and retarded economic growth.

regime allows countries to adjust their exchange rates gradually according to the economic conditions of their trading partners. The weight given to the particular currency is adjusted in the basket to reflect differences in price levels, interest rates or current account balances. Often, the weights assigned to currencies are not announced.<sup>4</sup> Frankel and Wei (1994) noted that both Korea and Malaysia assign heavy weights to the US dollar and they also pointed out that in the early 1990s Malaysia began to assign more weight to the yen. However, Kwan (1994) argued that countries in the NICs which compete with Japan in the international markets can reduce economic disturbances caused by yen/dollar rates by pegging to the yen. On the other hand, countries in ASEAN which relied on Japan for imports of manufactures and exports of commodities are better off not pegging to the yen.

The above changes in the economic structures and the patterns of trade in Malaysia, and to certain extent in Korea, have made them more susceptible to foreign real and monetary disturbances. The objective of this paper is to identify the importance of foreign shocks from the US and Japan, and whether there were any changes in the pattern of the shocks after the appreciation of the yen in 1985.

### III. Model and Methodology

The vector autoregressive (VAR) model is used to investigate the impact of policy shocks on the Malaysian and Korean economies. This is done through the use of impulse response functions and variance decompositions. After cointegrating the variables in the model, we proceed with the innovation accounting by estimating the vector error correction model. We include in each model a set of macro variables that plausibly represents the foreign and domestic influence on the small-country domestic output. Thus, the variables included are world oil price, output levels and money supplies of foreign countries (US and Japan), and the output level and money supply of the domestic country (Korea and Malaysia).

The multivariate model considered is:

$$W = [o^f, y^{us}, m^{us}, y^j, m^j, m^d, y^d]' \quad (1)$$

where  $o^f$  is the world oil price;  $y^{us}$ ,  $y^j$  are the output levels of the US and Japan;  $m^{us}$ ,  $m^j$  are the money supplies of the US and Japan;  $y^d$  and  $m^d$  are the domestic output and domestic money supply ( $d = \text{Korea, Malaysia}$ ). The output level and money supply of the US and Japan are the source of foreign real and monetary shocks. The world oil price is used to account for changes in prices of basic commodities that might influence the output and price level of Korea and Malaysia. The domestic shocks are from the output level and money supply of the individual countries. Here, under the assumption of a small open economy, domestic shocks from Korea and Malaysia have no effect on the output level and money supply of the larger economies. Also, Korea and Malaysia have no influence on

4. Most countries which peg their exchange rates keep the weight secret. This allows them to devalue their currency when required (Takagi, 1988).

the world oil price. Since we are interested in the changes before and after the Plaza Accord, we test to see whether splitting the sample in this way is significant, and then, analyse the Korean and Malaysian models for the two periods, 1974:01–1985:09 and 1985:10–1995:05.

Since the VAR technique (Sims, 1980) is well known, only a brief summary of the methodology is presented.<sup>5</sup> According to Engle and Granger (1987) and Granger (1988), a VAR model in levels with nonstationary variables may lead to spurious results and a VAR model in first differences with cointegrated variables is misspecified. In the latter case, error-correction terms (ECTs), which contain ‘long run relationships’ among the variables are reintroduced back into the VAR and the resulting model is known as a Vector Error Correction Model (VECM).

A seven-variable unrestricted VAR model (without the deterministic term) can be written as:

$$W_t = \Phi(L)W_t + e_t \quad (2)$$

where  $\Phi(L) = \Phi_1(L) + \dots + \Phi_p(L^p)$  and  $L$  is the lag operator. Here,  $W_t$  is a  $(7 \times 1)$  vector of time series,  $\Phi$  is a  $(7 \times 7)$  matrix of coefficients to be estimated,  $p$  is the selected lag length and  $e_t$  is the error term. Equation (2) can be rewritten as a VECM of the form,

$$\Delta W_t = \Phi(L)\Delta W_{t-1} + \alpha Z_{t-1} + e_t \quad (3)$$

where  $Z_{t-1}$  is the vector of error correction terms, which represent the deviations from the long-run relationships. We then invert Equation (3) into vector moving average representations and conduct innovation accounting exercises. The impulse response function allows us to analyse the dynamic response of a variable (i.e.,  $y^k$  or  $y^m$ ) due to a standard deviation shock to other variables (i.e.,  $o^f$ ,  $y^{us}$ ,  $y^j$ ,  $m^{us}$ ,  $m^j$ ,  $m^k$  or  $m^m$ ) in the model. In contrast, the variance decomposition gives the proportion of the forecast error variance of a variable that can be explained by its own shock as opposed to shocks to other variables in the system.

#### IV. Stationarity and Long-Run Properties of Data

##### IV.1 Data

Monthly data from the period 1974:01–1995:08 are obtained from the International Monetary Fund, *International Financial Statistics*, CD-ROM database. World oil price ( $o^f$ ) is measured by the oil price index (series 00176aadzf). The industrial production index (series 66, 1990 = 100) is used for the output level ( $y^{us}$ ,  $y^j$ ,  $y^k$  and  $y^m$ ). These series are seasonally adjusted at the source, except for Malaysia. Money supply for the US and Japan ( $m^{us}$  and  $m^j$ ) are measured by the reserve money (series 14) while the money stocks of Korea and Malaysia ( $m^k$  and  $m^m$ ) are measured by M1 (series 34). Malaysian industrial production index,

5. For a thorough survey, see Canova (1995).

especially after 1984 and Japanese money supply show a strong seasonal effect. Therefore, these two series,  $y^m$  and  $m^j$  are seasonally adjusted by using the X-11 procedure of SAS/ETS. All variables used in this study are expressed in log form.

Before proceeding with the empirical results, we test for a structural break at 1985:09. A likelihood ratio test yields  $\chi^2(203) = 335.84$  for Malaysia and  $\chi^2(203) = 372.80$  for Korea, strongly rejecting the null hypothesis of no structural change. Rather than speculating on whether this is due to the Plaza accord and the subsequent exchange rate policy or other developments, we split the data and treat the data as two distinct samples.

#### IV.2 Tests For Stationarity

We use the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to test for the stationarity of the variables for the two periods (1974:01–1985:09 and 1985:10–1995:08). Both ADF and PP tests take into account the presence of a non-zero mean, and a non-zero mean and a linear trend. The lag length is determined by the Bayesian Information Criterion (BIC). To save space, ADF and PP tests for log levels are not reported.

Table 2 presents the ADF and PP test statistics for the null hypothesis that each series is a unit root process in log first difference. In the ADF tests we are able to reject the null hypothesis of a unit root for all the series around a non-zero mean and a non-zero mean with a linear trend except  $m^{us}$ , which is not stationary around a non-zero mean and a linear trend in the second period. However, in the PP tests we reject the null hypothesis of a unit root for all the series in first difference. Therefore, we conclude that all the series are stationary after first difference; i.e., the series are integrated of order 1, i.e., they are I(1).

#### IV.3 Long-Run Relationships

Since the series are integrated of order one, Johansen's procedure is used to test for the existence of any cointegrating vectors among the seven variables in the model.<sup>6</sup> However, before this procedure is performed, we determine the appropriate lag length. We consider lag lengths up to six lags. In both models, the multivariate version of the Bayesian Information Criterion selects 6 lags. However, a likelihood ratio test fails to reject 4 lags against 6 lags. Hence in order to conserve degrees of freedom, we estimate the two models with 4 lags. We then proceed with cointegration tests.

The Johansen's  $\lambda_{\text{trace}}$  statistics for testing multiple cointegrating vectors are reported in the upper portion of Table 3. The  $\lambda_{\text{trace}}$  statistics test the null hypothesis that there are at most  $r$  cointegrating vectors against the general alternative. We observe that the null hypothesis of no cointegration ( $r = 0$ ) is rejected for both models by the  $\lambda_{\text{trace}}$  statistics, which means that there is at least one

6. For a detailed discussion on this procedure see Johansen (1988) and Johansen and Juselius (1990).

**Table 2 Unit Root Tests in Log First Differences**

Variables	Period I: 1974:01–1985:09		Period II: 1985:10–1995:08	
	ADF tests	PP tests	ADF tests	PP tests
With constant ( $\tau_u$ )				
$\Delta \ln o^f$	-8.93(0)*	-9.06*	-7.21(1)*	-7.40*
$\Delta \ln y^{us}$	-6.06(0)*	-6.19*	-9.09(0)*	-9.31*
$\Delta \ln m^{us}$	-11.57(2)*	-21.09*	-2.93(11)*	-19.70*
$\Delta \ln y^j$	-4.13(2)*	-12.80*	-5.11(2)*	-15.74*
$\Delta \ln m^j$	-10.74(1)*	-15.10*	-11.28(1)*	-19.02*
$\Delta \ln y^k$	-15.93(0)*	-15.38*	-8.61(3)*	-17.47*
$\Delta \ln m^k$	-13.90(0)*	-13.78*	-10.76(1)*	-14.92*
$\Delta \ln y^m$	-17.26(0)*	-17.69*	-10.75(2)*	-28.15*
$\Delta \ln m^m$	-17.98(0)	-18.41*	-15.30(0)*	-15.27*
With constant and trend ( $\tau_t$ )				
$\Delta \ln o^f$	-8.52(0)*	-9.07*	-6.97(1)*	-7.43*
$\Delta \ln y^{us}$	-6.17(0)*	-6.12*	-8.44(0)*	-9.32*
$\Delta \ln m^{us}$	-11.42(2)*	-21.09*	-2.92(11)	-19.72*
$\Delta \ln y^j$	-4.63(2)*	-13.04*	-5.57(2)*	-16.18*
$\Delta \ln m^j$	-11.09(1)*	-15.58*	-11.82(1)*	-21.24*
$\Delta \ln y^k$	-15.87(0)*	-15.79*	-8.64(3)*	-17.93*
$\Delta \ln m^k$	-14.14(0)*	-14.08*	-10.71(1)*	-14.85*
$\Delta \ln y^m$	-17.26(0)*	-17.69*	-9.79(2)*	-28.14*
$\Delta \ln m^m$	-18.25(0)*	-19.16*	-15.71(0)*	-16.08*

\* significant at the 5% level.

Notes: In the ADF tests, number of lags shown in the parentheses were determined by the Bayesian Information Criterion. Critical values for subsamples at 10% and 5% significance are -2.58 and -2.89 for  $\tau_u$  and -3.15 and -3.45 for  $\tau_t$ . The numbers of lags used in the PP tests were determined by Schwert (1987) formula,  $l_4 = \text{Int}\{4(T/100)^{0.25}\}$  to be four. The PP tests are based on the following equations:

$$X_t = v^* + \alpha^* X_{t-1} + \varepsilon_t \quad \text{and} \quad X_t = \bar{v} + \bar{\alpha} X_{t-1} + \bar{\beta}(t - T/2) + \varepsilon_t$$

where T is the number of observations. The null hypothesis that  $H_0: \alpha^* = 1$  and  $H_0: \bar{\alpha} = 1$  are tested by using the test statistics  $Z(t\alpha^*)$  and  $Z(t\bar{\alpha})$ . The critical values are similar to the above ADF tests ( $\tau_u$  and  $\tau_t$ ).

cointegrating vector in each model. In the Korean model, we fail to reject at most four cointegrating vectors ( $r \leq 4$ ) for the first period and at most three cointegrating vectors ( $r \leq 3$ ) for the second period. Hence the data indicate four cointegrating vectors for the first period and three cointegrating vectors for the second period for Korea. The test statistic for Malaysia indicates that the hypothesis of no cointegration ( $r = 0$ ) can be rejected while we fail to reject at most one cointegrating vector for the first period. For the second period, we fail to reject the null hypothesis of at most four cointegrating vectors; hence there seems to be evidence for one cointegrating vector in the first period and four cointegrating vectors in the second period.

**Table 3 Johansen's Test for Multiple Cointegrating Vectors**

Trace Statistics ( $\lambda_{\text{trace}}$ )								
$H_0$	$H_1$	95% Crit. Val.	Period I: 1974:01–1985:09		Period II: 1985:10–1995:08			
			Korea	Malaysia	Korea	Malaysia		
$r = 0$	$r > 0$	124.24	172.74*	126.35*	162.31*	185.01*		
$r \leq 1$	$r > 1$	94.15	124.18*	87.50	113.88*	132.71*		
$r \leq 2$	$r > 2$	68.52	80.64*	54.86	71.84*	84.59*		
$r \leq 3$	$r > 3$	47.21	50.19*	35.21	42.98	50.13*		
$r \leq 4$	$r > 4$	29.68	27.72	19.22	25.04	26.63		
$r \leq 5$	$r > 5$	15.41	9.17	9.04	10.27	10.95		
$r \leq 6$	$r > 6$	3.76	0.52	1.79	0.96	0.03		

Normalized Cointegrating Vectors								
Period I	Korea	0.11	-0.23	0.84	-1.34	1.07	-0.91	1
		0.01	-0.09	1.69	-4.05	-0.88	-0.08	1
		1.32	3.88	21.57	-11.14	-17.15	-0.58	1
	Malaysia	0.05	-1.31	0.16	0.92	-0.66	-0.46	1
		0.19	0.19	1.93	-3.32	-0.69	-0.23	1
Period II	Korea	-0.46	3.85	-3.21	-8.20	5.69	-1.10	1
		0.42	0.50	1.14	-1.04	0.04	-0.93	1
		-0.10	0.55	-1.54	-0.26	-0.13	0.15	1
	Malaysia	-0.17	-0.34	-1.28	-0.44	0.10	-0.03	1
		0.19	-0.33	-0.25	0.94	-1.22	-0.11	1
		0.11	1.56	-1.17	-1.81	0.75	-0.46	1
		0.61	-1.27	5.73	-8.91	8.49	-4.31	1

Notes: (\*) indicates significance at the 5% level. Variables included in the VAR: [ $o^f, y^{us}, m^{us}, y^j, m^j, m^d, y^d$ ]. Number of lags is 4. Test assumes linear deterministic trend in the data.

The lower portion of Table 3 reports the normalized cointegrating vectors for each model. The cointegrating vectors are normalized with respect to the small countries' domestic output. As indicated earlier, there is more than one cointegrating vector in each model except for Malaysia in the first period. It is known that coefficients of cointegration relations cannot be interpreted as elasticities (Lütkepohl, 1994); this is because the *ceteris paribus* assumption may not be meaningful. The error correction specification and impulse response functions based on this specification can be more informative.

**V. Foreign and Domestic Shocks**

In order to evaluate the effects of foreign and domestic shocks on Korean and Malaysian output, we estimate the vector error correction model with all significant cointegrating vectors imposed (i.e., those presented in Table 3). Orthogonalization is achieved through Choleski decomposition where the order

**Table 4** Variance Decomposition of Korean Output

Horizon	Percentage of forecast error due to innovations in						
	$\Delta \ln o^f$	$\Delta \ln y^{us}$	$\Delta \ln m^{us}$	$\Delta \ln y^j$	$\Delta \ln m^j$	$\Delta \ln m^d$	$\Delta \ln y^d$
Period I: 1974:01–1985:09							
1	0.3	0.6	0.6	0.4	1.8	2.3	93.9
6	14.6	0.9	8.4	1.6	5.4	14.0	55.0
12	31.3	0.4	14.8	1.5	2.0	28.9	21.0
18	34.7	1.2	16.0	1.1	1.8	34.9	10.4
24	33.6	2.7	15.6	1.0	3.2	37.4	6.5
30	31.7	4.5	15.1	1.0	4.7	38.2	4.7
36	29.9	6.3	14.6	1.0	6.2	38.3	3.7
Period II: 1985:10–1995:08							
1	0.1	1.1	0.4	0.9	0.4	4.0	93.1
6	4.0	5.5	3.8	5.4	2.8	8.3	70.4
12	7.0	7.5	4.8	5.8	3.0	8.1	63.8
18	12.4	6.5	6.1	9.3	5.5	6.9	53.2
24	16.0	6.0	7.4	13.2	8.2	5.6	43.6
30	18.2	6.7	8.5	15.9	9.9	4.4	36.6
36	19.2	8.1	9.4	17.0	10.6	3.5	32.2

of the variables corresponds to the order in Equation (1); i.e., world oil price, US output, US money, Japanese output, Japanese money, domestic money, domestic output.<sup>7</sup> Since results may be sensitive to the ordering in the Choleski decomposition, variance decomposition from a reverse ordering are reported in an Appendix (Tables A1 and A2).

Variance decomposition of Korean output is given in Table 4. It is evident from the table that domestic shocks are significant in the short run while foreign shocks are more important in the long run. Specifically, after 36 months, foreign shocks account for 58% of Korean output in the first period and approximately 64% in the second period. While there is a slight increase in the effect of the US output, the effect of the US money supply in the long run declines from the first to the second period in Korea. The effect of Japanese shocks (money and output shocks combined) show a dramatic increase accounting for more than 27% of Korean output at a forecast horizon of 36 months in the second period as compared to 7% in the first period. Note that the long-run effect of the world oil price declines in Korea from the first to the second period.

Variance decomposition of Malaysian output is given in Table 5. Except for the sizeable effect of US output, Malaysian output seems to explain its own forecast error variance in the first period. At 36-month forecast horizon, US output innovations seem to explain 33.2% of forecast error variance in the first period. In total at the 36-month forecast horizon, foreign shocks account for

7. For innovation accounting with cointegrated variables, see Lütkepohl and Reimers (1992).

**Table 5 Variance Decomposition of Malaysian Output**

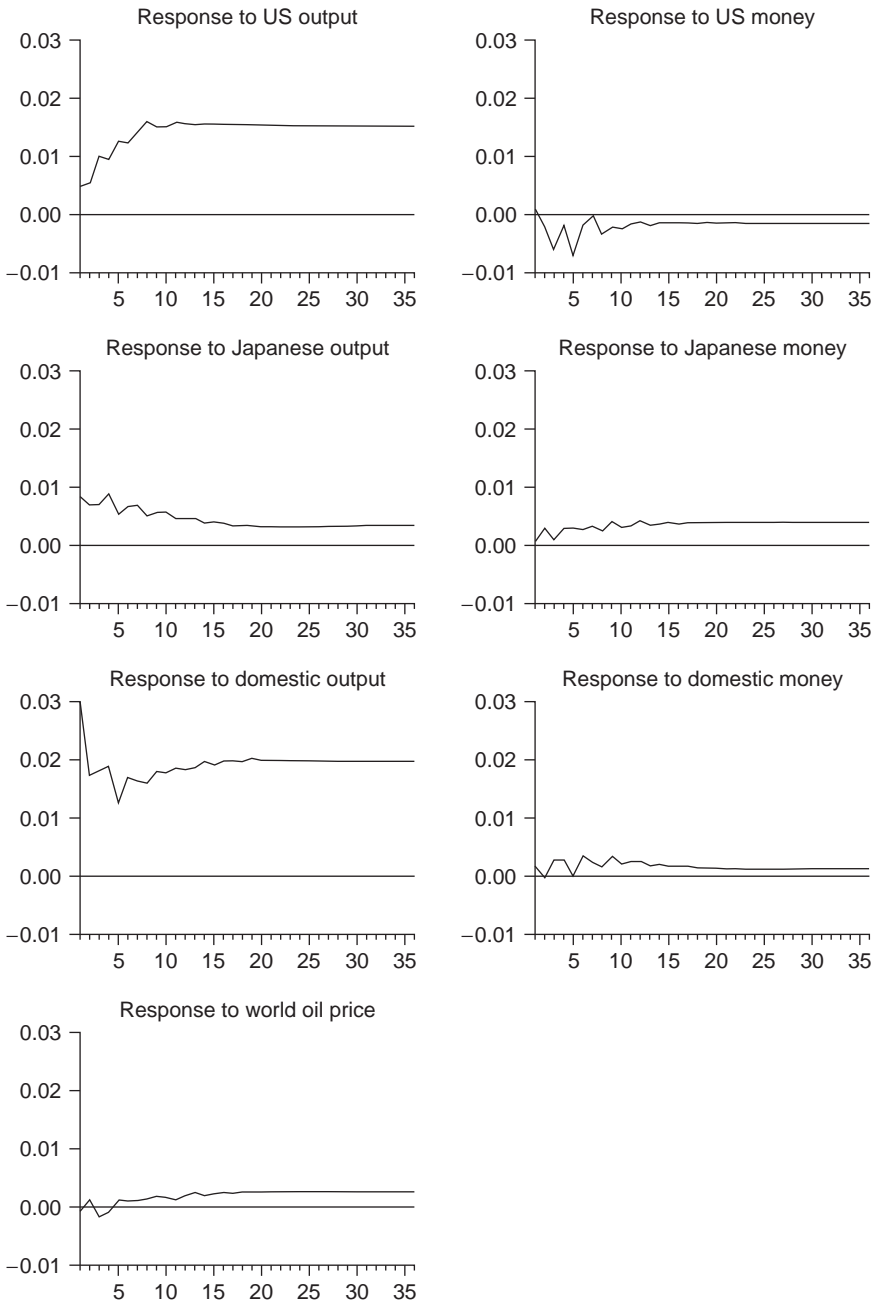
Horizon	Percentage of forecast error due to innovations in						
	$\Delta \ln o^f$	$\Delta \ln y^{us}$	$\Delta \ln m^{us}$	$\Delta \ln y^j$	$\Delta \ln m^j$	$\Delta \ln m^d$	$\Delta \ln y^d$
Period I: 1974:01–1985:09							
1	0.1	2.3	0.1	7.1	0.1	0.2	90.1
6	0.3	16.4	3.0	9.3	1.1	0.9	69.0
12	0.3	28.1	1.9	7.0	1.6	1.0	60.1
18	0.5	31.2	1.3	5.3	1.8	0.8	59.1
24	0.7	32.2	1.1	4.2	1.9	0.7	59.3
30	0.7	32.8	0.9	3.7	2.0	0.6	59.2
36	0.8	33.2	0.8	3.3	2.1	0.5	59.2
Period II: 1985:10–1995:08							
1	0.9	0.4	7.8	0.3	2.5	0.3	87.9
6	4.4	10.7	8.1	2.6	5.9	3.9	64.3
12	3.8	14.6	10.1	4.0	5.9	3.4	58.3
18	4.2	16.9	10.4	6.3	5.3	3.2	53.8
24	5.3	18.0	9.7	10.4	4.7	2.9	49.0
30	6.4	18.7	8.9	14.3	4.3	2.7	44.6
36	7.5	19.3	8.1	17.6	4.0	2.7	40.8

about 40% of Malaysian output in the first period. However, at the same forecast horizon, combined foreign shocks account for more than 56% of Malaysian output in the second period. This is consistent with the increase in openness reported in Table 1 for the Malaysian economy. As the Malaysian economy became more open to international trade, domestic output growth became more susceptible to foreign influences. Note also that the effect of the US shocks on the Malaysian economy slightly declined at the 36-month forecast horizon from the first to the second period (34 vs. 27.4) whereas the effect of the Japanese shocks have increased (5.4 vs. 21.6).

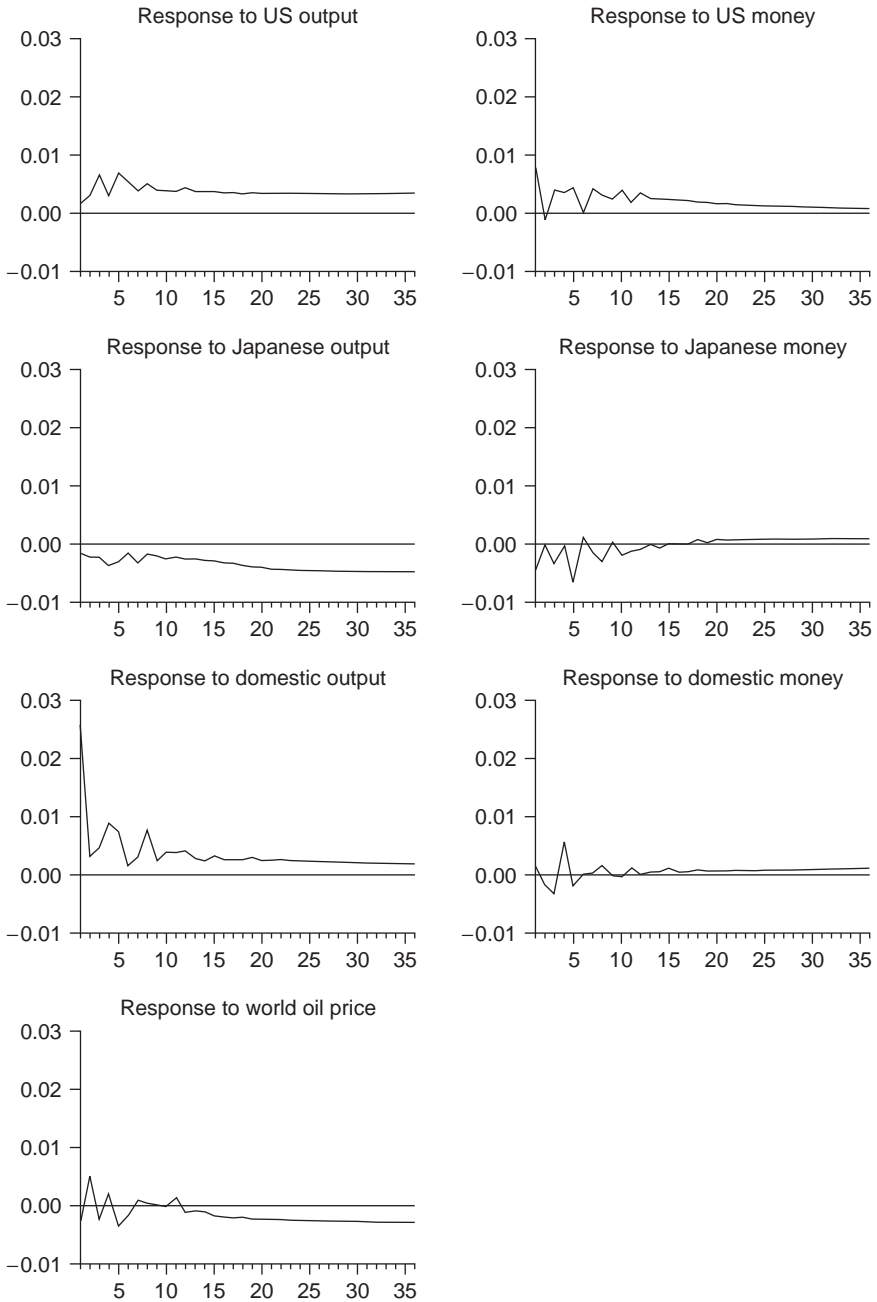
Moreover, a close inspection of Tables 4 and 5 reveals that foreign shocks had a sizeable effect on Korea in both periods whereas Malaysia has only recently been influenced by foreign shocks. The transformation of the Malaysian economy from an exporter of primary commodities to a an exporter of labour-intensive manufactured goods is probably an important factor. More importantly, the increased level of openness made the Malaysian economy more susceptible to foreign shocks. Finally, as Tables A1 and A2 in the Appendix show, our results are not unduly sensitive to the ordering in the Choleski decomposition.

The dynamic interrelationships among the variables can best be understood by examining the impulse response functions. Figures 1 and 2 report the responses of Malaysian output to a one-standard-deviation innovation in foreign and domestic variables. Figure 1 indicates that in the first period, the US output had an expansionary permanent effect on Malaysian output before the Plaza accord. The response to a US money supply shock was negative but was not pronounced.

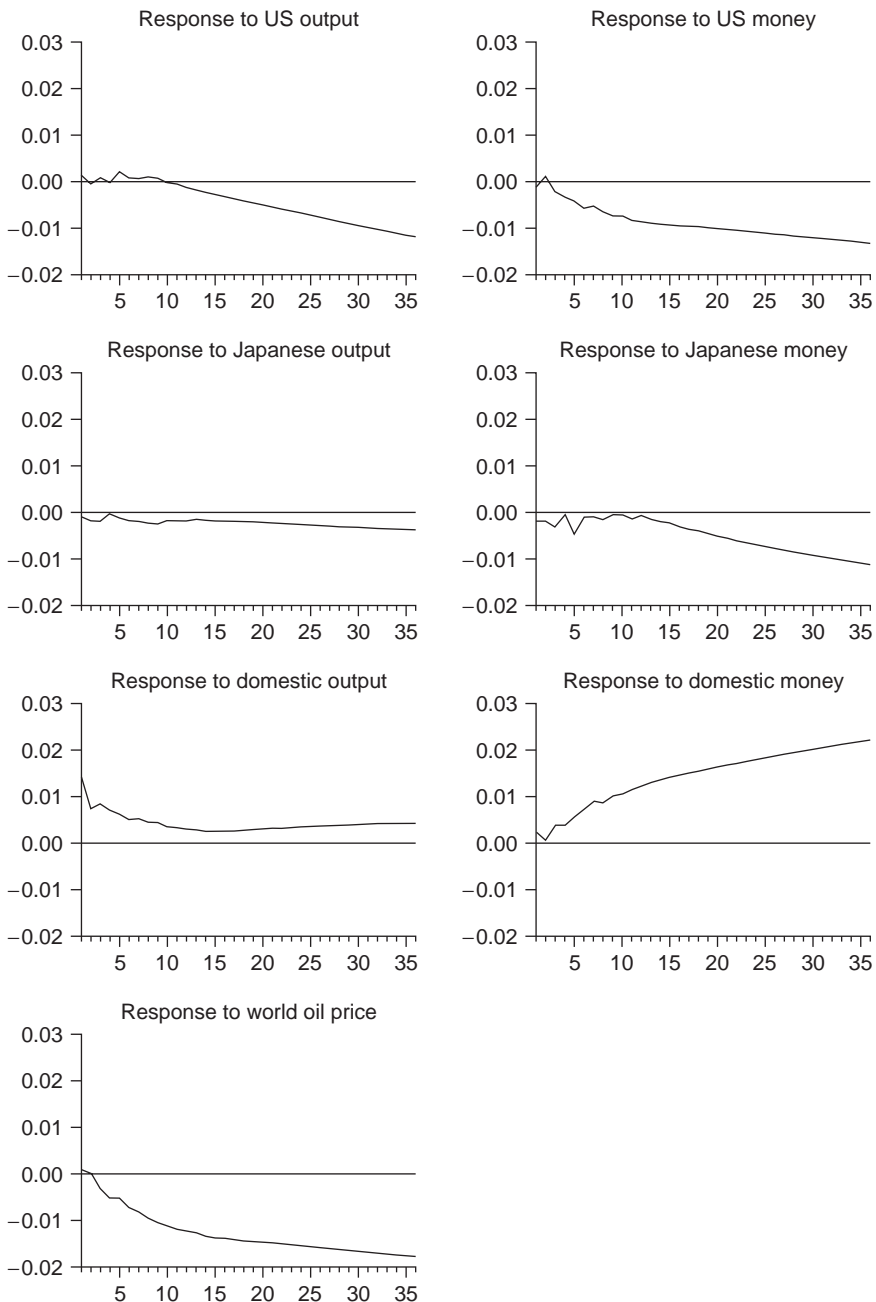
**Figure 1 Response of Malaysian Output to Foreign and Domestic Shocks: Before the Plaza Accord**



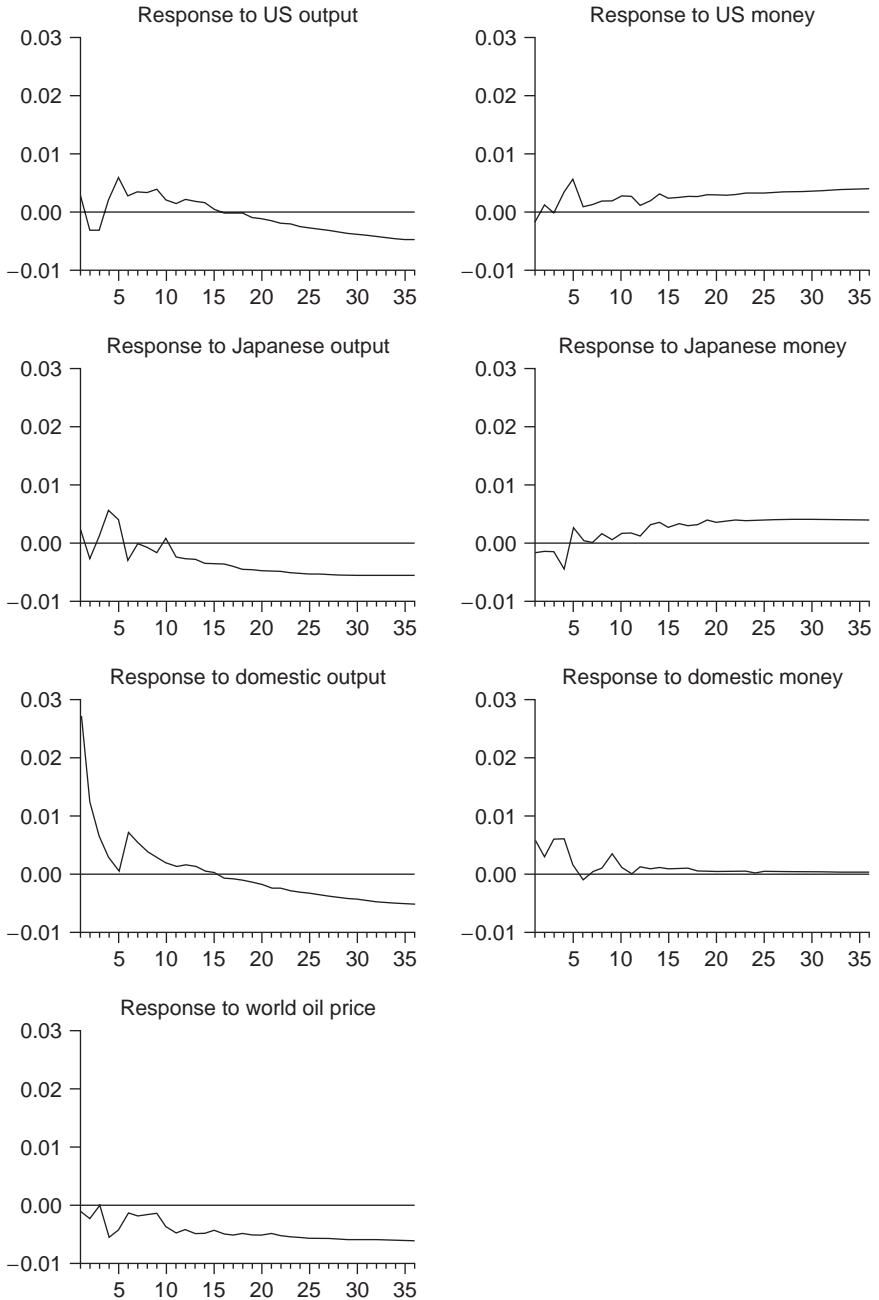
**Figure 2 Response of Malaysian Output to Foreign and Domestic Shocks:  
After the Plaza Accord**



**Figure 3 Response of Korean Output to Foreign and Domestic Shocks: Before the Plaza Accord**



**Figure 4 Response of Korean Output to Foreign and Domestic Shocks:  
After the Plaza Accord**



Notice that the effect of Japanese output on Malaysian output was expansionary but smaller than the effect of a US output shock. Similarly Japanese money had a small but expansionary effect on Malaysian output. Responses to domestic output and domestic money were positive with a pronounced domestic output effect. In response to a world oil price shock, Malaysian output contracted slightly and then increased. Oil prices may have complex effects depending on the long-run substitution in production, the degree of dependence on imported oil, downward wage flexibility to absorb the shock without persistent unemployment, and demand-deflationary effects of rising oil imports. Figure 2 gives the response of Malaysian output to various shocks after the Plaza accord. A noteworthy aspect of the figure is the apparent decline of the expansionary effect of a US output shock. US money supply shocks had a small but positive effect. Japanese output had a negative effect while Japanese money supply had a positive long-run effect. The world oil price seemed to have a negative effect on Malaysian output in the long run.

Figure 3 and 4 give the responses of Korean output. Korean output seemed to respond negatively to foreign shocks in the first period except for the positive US output effect in the short run. This contrasted with mostly positive effects of foreign shocks in the second period. The effect of the world oil price was negative in both periods. While some of the negative responses are hard to reconcile with the trade multiplier (repercussion) effects typical of textbook models where expansion in one country increases demand for the products of the other and leads to expansion in the other country, a close inspection of Figures 1–4 reveals an interesting pattern.<sup>8</sup> While Malaysian and Korean responses to foreign shocks differed before the Plaza accord, Figures 2 and 4 indicate that the pattern of the responses was similar after the Plaza accord. This may be due to increased synchronization of the business cycle in the region and convergence. Clearly, additional evidence is needed to assess the degree of convergence in the response to foreign shocks.

## VI. Concluding Remarks

In this study we shed some light on the hypothesis that the dominance of the US economy on East Asian countries has declined and is being replaced by the more regional influence of Japan. Our approach has been to explore variance decompositions and impulse response functions from a vector error correction model to assess the importance of foreign shocks from the US and Japan on Korean and Malaysian output. Using monthly data from 1974:01 to 1995:08 we test for a breakpoint around the Plaza Accord (1985:09) and find supportive evidence. Rather than speculating about whether this is due to rapid developments in the economy or policy initiatives brought about by the Plaza accord, we focus on comparisons between the two subperiods.

8. Examination of impulse response functions from a reverse ordering in the Choleski decomposition leads to negligible change in the results.

First, the relative importance of the US economy in the East Asian countries as seen from Korea and Malaysia in our sample period has declined. After the Plaza Accord, US real and monetary shocks account for a relatively smaller proportion of forecast error variance of output in both countries. Second, the effect of world oil price declined in Korea while it increased in Malaysia. Stable oil prices in the 1980s may have contributed to the results in Korea; the growth of a manufacturing sector that relies heavily on oil may explain the increase in the role of the world price during the second period in Malaysia.

Our results imply that the effect of US monetary shocks declined in Korea from the first to the second period while the effect of Japanese monetary shocks increased. In Malaysia, the effects of both US and Japanese monetary shocks seem to have increased. The increase of Japanese influence in the region is perhaps due to the growing integration of markets in the East Asian region. At the same time, the increase in the monetary influence of Japan can be explained by the dependence on Japanese FDI and the liberalization of the domestic financial system. While the effect of foreign shocks on the domestic economy seems to be high in both periods for Korea, the effect of foreign shocks on the Malaysian economy substantially increased in the second period. The increasing influence of foreign shocks and the importance of Japanese shocks may be a partial explanation of why Korea and Malaysia were hard hit by the recent Asian crisis.

**Appendix**

**Table A1 Variance Decomposition of Korean Output: Reverse Order**

Horizon	Percentage of forecast error due to innovations in						
	$\Delta \ln o^f$	$\Delta \ln y^{us}$	$\Delta \ln m^{us}$	$\Delta \ln y^j$	$\Delta \ln m^j$	$\Delta \ln m^d$	$\Delta \ln y^d$
Period I: 1974:01–1985:09							
1	0.0	0.0	0.0	0.0	0.0	0.0	100.0
6	12.5	0.6	3.2	0.7	3.2	15.7	64.1
12	24.7	0.4	6.1	0.3	1.4	39.7	27.4
18	26.4	0.8	6.2	0.2	1.6	49.7	15.1
24	24.9	2.1	5.4	0.3	2.7	53.6	10.9
30	23.1	3.7	4.7	0.5	3.8	55.1	8.9
36	21.4	5.4	4.2	0.8	4.8	55.5	7.8
Period II: 1985:10–1995:08							
1	0.0	0.0	0.0	0.0	0.0	0.0	100.0
6	2.6	3.9	5.7	6.0	2.5	4.2	75.1
12	4.1	4.6	9.1	5.9	3.4	4.5	68.4
18	6.7	4.1	12.6	6.6	7.5	5.4	57.0
24	8.3	4.9	14.4	7.3	10.9	6.5	47.7
30	9.3	6.8	14.9	7.5	12.7	7.6	41.2
36	9.7	9.1	14.9	7.2	13.1	8.6	37.4

**Table A2 Variance decomposition of Malaysian Output: Reverse Order**

Horizon	Percentage of forecast error due to innovations in						
	$\Delta \ln o^f$	$\Delta \ln y^{us}$	$\Delta \ln m^{us}$	$\Delta \ln y^j$	$\Delta \ln m^j$	$\Delta \ln m^d$	$\Delta \ln y^d$
Period I: 1974:01–1985:09							
1	0.0	0.0	0.0	0.0	0.0	0.0	100.0
6	0.3	8.5	3.1	1.8	0.2	0.5	85.7
12	0.3	17.6	1.8	1.6	0.2	0.6	78.0
18	0.5	20.5	1.3	1.1	0.1	0.4	76.2
24	0.6	21.6	1.0	0.8	0.1	0.3	75.5
30	0.7	22.3	0.9	0.6	0.1	0.3	75.1
36	0.8	22.8	0.8	0.5	0.1	0.3	74.8
Period II: 1985:10–1995:08							
1	0.0	0.0	0.0	0.0	0.0	0.0	100.0
6	4.3	8.8	1.7	1.6	2.1	4.0	77.5
12	4.2	11.1	3.7	2.4	2.0	3.4	73.0
18	3.8	13.1	5.0	3.8	2.3	3.0	68.9
24	3.7	14.6	5.4	6.5	3.4	2.7	63.7
30	3.7	15.9	5.4	9.2	4.7	2.4	58.7
36	3.8	17.2	5.4	11.4	5.7	2.3	54.2

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