Chapter 47

POLICY COORDINATION BETWEEN WAGES AND EXCHANGE RATES IN SINGAPORE

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Abstract

Singapore's unique experience in macroeconomic management involves the government's engagement in a tripartite collective bargaining and its influence on the macroeconomic policy game in wages and exchange rates in response to inflation and output volatility. The period from the mid-1980s to mid-1990s features the policy game with a Nash equilibrium in the level of wages and exchange rates and a non-Nash equilibrium in wage growth and exchange rate appreciations. Based on the empirical evidence in this period, the models used in this study suggests that wage and exchange-rate policies are a pair of complements both at their levels (Nash equilibrium) and at their percentage changes (non-Nash equilibrium).

Keywords: wages; effective exchange rates; collective bargaining; Nash equilibrium; National Wages Council; Monetary Authority of Singapore; unit labor cost; macroeconomic stabilization; inflation; unemployment

47.1. Introduction

Adverse supply shocks often pose a dilemma for the Keynesian approach to aggregate demand management: implementing expansionary monetary and fiscal policies tend to exacerbate inflation, whereas the laissez-faire policy stance is conducive to acute and prolonged unemployment before the economy restores its natural rate level of output. As an alternative means to avoid the predicament and cope with demand shocks as well as supply shocks, appropriate labor market policies, including wage policy, are recently gaining importance in macroeconomic management.[1] Nevertheless, wages tend to be sticky downward and it becomes difficult to attempt to reduce them due to the existence of strong labor unions or laws prohibiting such measures. The idea of instituting an agreement by unions and corporations to link wage growth with productivity growth, though attractive, often faces great political and economic challenges when it is put in practice.[2] Accordingly, in general, there is a dearth of research on the effectiveness of wage policy in an environment where other aggregate demand policies exist.

Singapore is an ideal case for the study of the effectiveness and dynamics of wage and exchange-rate polices, not only because it has actively deployed wage policy in combination with exchange-rate policy for more than two decades but also because it has maintained a remarkable record of sustained economic growth with low inflation in a small open economy.[3] As a highly opened small economy, Singapore faces the challenges of "imported" foreign inflation as well as the wage-push inflation that results from rapid economic growth and labor shortage. The exchange rate and wage movements naturally become the two interrelated key factors in maintaining macroeconomic stability. Specifically, the wage policy manipulated by a tripartite collective bargaining institution known as the National Wages Council (NWC) has actually acted as an important complement to the country's exchange-rate policy controlled by the Monetary Authority of Singapore (MAS) (Otani and Sassanpour, 1988; Wu, 1999).

The NWC is made up of representatives from the government, labor unions, and employer federations. Its main function is to select a wage policy that is not only agreeable by all three parties but also compatible with macroeconomic targets. Although the NWC's wage recommendations only sketch a guideline for negotiations between employers and employees, both public and private sectors usually accept and implement them rather smoothly. The resulting collective bargaining agreements often extend to nonunion workers as well. Labor unions in Singapore actively promote sound economic policies to their members and support restraints when needed. In this way, the wage council helps to reduce the frictions that information asymmetry and costly bargaining often cause in supply-side adjustments.[4] In coordination with the NWC's endeavor in achieving orderly wage settlements, the Monetary Authority of Singapore (MAS), as the other key player in Singapore's macroeconomic management, chooses the optimal exchange rate variation to cope with the dual inflationary pressures (i.e. the imported inflation and the inflation pushed by labor shortages) and to maintain the economy's competitiveness.

With its focus on the role of collective bargaining in macroeconomic management in Singapore, this study attempts to model the policy game of wage and exchange rate policies between the NWC and the MAS. The study starts with an analysis of the behavior of wage and exchange rate levels in the policy game and its empirics. It then further derives the MAS's exchange-rate response function and the NWC's wage response function in terms of percentage changes of the two policies, and analyzes two interplay patterns of the two response functions: the Nash game and the non-Nash game. For the non-Nash game, the study calibrates the analytical outcome in each of the three potential scenarios of the economy: inflation, recession, and the "Goldilocks" scenario (neither inflationary nor recessionary), and compares the simulation results with the actual quarterly growth paths under the two policy rules for the period from 1987:1 to 1996:4.

47.2. Complementarity of Wages and Exchange Rates

This section presents a policy-game model of wages and exchange rates at their levels.[5] For analytical simplicity, consider a composite product traded internationally under the purchasing power parity. Suppose that workers (employees) exert their influence in cooperation with the government and employers rather than through militancy. Wages are negotiated between firms and workers for each period. The representative firm hires workers to produce output q according to a production function $q(L) = L^{\phi}(0 < \phi < 1)$. In wage negotiations, the right-to-manage model is used, whereby workers bargain with employers for desired wages and employers choose employment at the negotiated wage level.[6]

Let W be the nominal wage, E the nominal exchange rate measured as units of the domestic currency per unit of a foreign currency, P^{f} the price of the tradable good in the foreign currency, L^* the level of employment demanded as a function of the real wage W/EP^{f}, i.e. $L^*(W/EP^{\mathrm{f}})$, and r the alternative source of income in real terms (unemployment compensation, for example) when the negotiating parties fail to agree upon W. Additionally, a constant-elasticity-of-substitution function $U(x) = x^{1-\gamma}/(1-\gamma)$ $(0 < \gamma < 1)$ determines a representative worker's increasing and concave utility of the earned real income x. Denote the gain to the firm from agreeing to any given wage by $G_{\mathrm{F}}(W; EP^{\mathrm{f}})$ and the similar gain to workers by

$G_L(W;\ EP^f,\ r)$, respectively. The role of the NWC is to incorporate any exchange-rate policy signal into the wage settlement process and guide the two negotiating parties to choose a wage level to maximize the generalized Nash product, a weighted geometric average of the gains to workers and to firms:

$$\{G_F(W;EP^f)\}^s\{G_L(W;EP^f,r)\}^{1-s} \equiv \left\{EP^f q\left[L^*\left(\frac{W}{EP^f}\right)\right] - WL^*\left(\frac{W}{EP^f}\right)\right\}^s \left\{L^*\left(\frac{W}{EP^f}\right)\left[U\left(\frac{W}{EP^f}\right) - U(r)\right]\right\}^{1-s} \quad (47.1)$$

where $s(0 < s < 1)$ is a weight reflecting the relative bargaining strength of workers. The variation of s traces out all the negotiated wages between the reservation level and the monopoly level in a Nash bargaining.

The first-order optimality condition determines the negotiated wage as

$$w = e + p^f + (1-\phi)s + \frac{\phi}{1-\gamma} + \ln r, \quad (47.2)$$

where the lower case variables denote their logarithms and the last two parametric terms are the result of Taylor's approximation. Equation (47.2) gives the wage negotiator's reaction function, which predicts the unit elasticities of wages with respect to the exchange rate and to the foreign price level, respectively. Furthermore, the Nash bargaining wage is greater the larger the workers' bargaining power (s), the higher the productivity (ϕ), the greater the unemployment compensation (r), and the greater the elasticity of marginal utility (γ).

Since employment is determined by the firms' demand for labor at the negotiated level of real wage, aggregate output, Y, is a decreasing function of the real wage. Let L^A be aggregate employment and $F(L^A)$ aggregate output. Since the Cobb–Douglas production function determines aggregate output, it then follows that $Y = F(L^A(w - e - p^f)) \equiv h(w - e - p^f) = (w - e - p^f)^{\phi(\phi-1)}$, with $h' = F'L^{A'} < 0$ and $h'' = F''L^{A'} + F'L^{A''} > 0$. The monetary-fiscal authority has a loss function, Ω, which involves a cost associated with the inflation rate, $\pi \equiv De + Dp^f$ (D is the first-order difference operator) and the deviations of the current account from its target level, $\Theta > 0$ (See Wu (1999) for the detailed derivation of current account balance, CA).

$$\Omega = \frac{a}{2}\pi^2 - (\text{CA} - \Theta). \quad (47.3)$$

The current account surplus, unlike inflation, is favorable to the government so that a negative weight is attached to the second term in the loss function.[7] Inflation costs rise at an increasing rate with the rate of inflation, and the coefficient $a > 0$ measures the authority's intolerance of inflation. The authority's problem is to choose the exchange rate to minimize the loss function (Equation (47.3)). The associated first-order condition is

$$a(De + Dp^f) + \frac{1-c}{1+\psi}h'(w - e - p^f) + \frac{\psi}{1+\psi}\tau\lambda = 0, \quad (47.4)$$

where c is the marginal propensity to consume with respect to changes in disposable income, λ the weight for changes in the exchange rate in the balance payment account as opposed to changes in real foreign reserves ($0 < \lambda < 1$), and τ^{-1} is the sensitivity of exchange rate appreciation with respect to the balance of payments ($\tau^{-1} < 0$); in addition,

$$-1 < \psi \equiv \frac{\beta}{1-\lambda}\left[\frac{d}{\theta} - (\rho - r)\right] < 0,$$

where β is offset coefficient between domestic and foreign components of the monetary base $(0 < \beta < 1), \theta$ the proportion of CPF liabilities invested in government securities, d the marginal propensity to consume with respect to changes in real private saving, r the real interest rate on the government debt, and ρ the real rate of return on the debt-financed government overseas investment. Equation (47.4) implicitly determines the government's reaction function of the exchange rate to changes in the wage level, which, in turn, influences the wage that wage negotiators in the private sector demand. Therefore, the reaction function also indirectly conveys a signal of the government preference about the desired wage level with respect to the optimal exchange rate.

The wage-negotiators' reaction function (47.2), with the unemployment compensation parameter r being normalized to unity, and the government's reaction function (47.4) jointly determine the static equilibrium (e^*, w^*). The corresponding dynamic system in the neighborhood of (e^*, w^*) is

$$\begin{aligned}\dot{e} &= g_1(e, w) \\ &= -a(De + Dp^{\mathrm{f}}) \\ &\quad - \frac{1-c}{1+\psi}h'(w - e - p^{\mathrm{f}}) - \frac{\psi}{1+\psi}\tau\lambda,\end{aligned} \tag{47.5}$$

$$\dot{w} = g_2(e, w) = e - w + p^{\mathrm{f}} + (1-\phi)s + \frac{\phi}{1-\gamma} \tag{47.6}$$

where $\dot{e}$ and $\dot{w}$ are the time derivatives of e and w. The dynamic system of the exchange rate and wages is stable as long as inflation is so expensive that a depreciation increases inflation costs more than strengthens competitiveness, that is,

$$a > \frac{1-c}{1+\psi}h''.$$ [8]

The empirical analysis with a vector error correction (VEC) model below demonstrates the robustness of the negative relationship between the exchange rate and wages obtained from comparative statics.

There are three variables: the logarithm of unit labor costs of all sectors (LULC,); the logarithm of the nominal effective exchange rate (LNEER); and the logarithm of the import price (LIMP) index compiled using the US dollar prices. The quarterly data are from the *International Financial Statistics*, ranging from 1980:1 to 1997:1. The augmented Dickey–Fuller test suggests that the three variables are all $I(1)$ sequences.[9] The model is set with four-quarter lags by the conventional criteria, and the Johanson cointegration test suggests that there are exactly two cointegrating equations. Formally, after depressing the lagged difference terms, the estimated vector error correction model with four-period lags can be written as

$$DY_t = \alpha\beta' Y_{t-1} + \ldots + \varepsilon_t, \tag{47.7}$$

where $\boldsymbol{DY}_t = (\mathrm{DLULC}_t,\ \mathrm{DLNEER}_t,\ \mathrm{DLIMP}_t)'$, $\boldsymbol{Y}_{t-1} = (\mathrm{LULC}_{t-1},\ \mathrm{LNEER}_{t-1},\ \mathrm{LIMP}_{t-1},\ 1)'$, $\boldsymbol{\alpha}$ is a 3×2 matrix of the speed-of-adjustment parameters estimated as $[\boldsymbol{\alpha_1\alpha_2\alpha_3}]'$ with $\boldsymbol{\alpha_1} = (-0.10, -0.01)$, $\boldsymbol{\alpha_2} = (-0.03, -0.18)$, and $\boldsymbol{\alpha_3} = (0.09, 0.07)$, $\boldsymbol{\beta}$ is a 4×2 matrix of the normalized cointegrating vectors given by $[\boldsymbol{\beta_1\beta_2}]$with $\boldsymbol{\beta_1} = (1, 0, -1.05, 0.09)'$, and $\boldsymbol{\beta_2} = (0, 1, 1.06, -9.46)'$, and $\boldsymbol{\varepsilon}_t = (\varepsilon_{\mathrm{t,LULC}}, \varepsilon_{\mathrm{t,LNEER}}, \varepsilon_{\mathrm{t,LIMP}})'$ is the vector of white-noise disturbances.

The estimated cointegrating coefficients in the matrix $\boldsymbol{\beta}$ are significant with wide margins even at 1 percent significance level. According to the two cointegration equations, responding to an increase of 1 percentage in import prices, wages increase by 1.05 percent and the exchange rate decreases by 1.06 percent in the long run. It follows that the purchasing power of wages in Singapore, measured in a basket of foreign currencies, has been rising in terms of imported goods. Derived from the two estimated cointegrating equations, the deterministic long-run equilibrium relationship can be described as

$$\mathrm{LULC} = 9.28 - 0.99\mathrm{LNEER}. \tag{47.8}$$

Equation (47.8) says that on average, each percentage of wage growth goes hand in hand with an approximately equal percentage of the Singapore currency appreciation vis-à-vis a basket of foreign currencies. The estimated speed-of-adjustment coefficients in $\boldsymbol{\alpha}$ reflect the dynamic adjustment mechanism and support the robustness of the long-term equilibrium relationship. Suppose that one-unit positive shock in import prices results in a negative deviation in the unit labor cost and a positive deviation in the exchange rate from the previous period's stationary equilibrium, respectively. In response to the disequilibrium errors, the growth of unit labor cost increases by 10 percent as suggested by the first adjustment coefficient in $\boldsymbol{\alpha_1}$ and the appreciation rate increases by 18 percent as suggested by the second adjustment coefficient in $\boldsymbol{\alpha_2}$. Both the speed-of-adjustment coefficients are significant at 1 percent level and convergent as well.[10]

47.3. Policy Games in Wage Growth and Exchange Rate Appreciation

This section explicitly models the tripartism between employers, union workers, and the government as the institutional foundation to form the NWC objective function.[11] Employers as a whole concern themselves with the competitiveness of their products in the world market, which hinges highly upon relative unit labor cost. Union workers, on the other hand, are interested in maintaining a balance between employment and the growth of real income. Unlike the groups of union workers and employers, the government targets healthy macroeconomic performance characterized by a balance between inflation and unemployment.

The growth rate of ULC (g_{ULC}) is a weighted average of the wage-growth rate (g_{w}) and the inflation rate (π): $g_{\mathrm{ULC}} = (1-\theta)g_{\mathrm{w}} + \theta\pi$, where the weight θ is actually the parameter in a power function of labor productivity.[12] Denote the growth rate of foreign unit labor cost by $g_{\mathrm{ULC^f}}$, then the expression $[1-\theta)g_{\mathrm{w}} + \theta\pi + g_{\mathrm{NEER}} - g_{\mathrm{ULC^f}}]$ describes the evolution of relative unit labor costs. Formally, the NWC chooses the growth rate of wages to minimize its loss function

$$\begin{aligned}\mathrm{Loss}_{\mathrm{NWC}} = {} & \alpha_1[1-\theta)g_{\mathrm{w}} + \theta\pi + g_{\mathrm{NEER}} - g_{\mathrm{ULC^f}}] \\ & + \alpha_2\left[\frac{1}{2}(U-\hat{U})^2 + \frac{\gamma}{2}(\pi-\hat{\pi})^2\right] \\ & + \alpha_3[\beta(g_{\mathrm{w}}-\pi) + U]\end{aligned} \tag{47.9}$$

where $\hat{U}$ and $\hat{\pi}$ are the rates of unemployment and inflation targeted by the government, β the union workers' loss weight of real income relative to unemployment, γ the government's loss weight of inflation relative to unemployment, and α_1, α_2, α_3 represent the three weights associated with the loss functions of employers, the government, and union workers, respectively (these α's are the proxy parameters for the NWC participants' bargaining power). Note that $\gamma > 0, \beta < 0, \alpha_i > 0,$ and $\Sigma\alpha_i = 1$. The first term in (47.9) describes the cost to employers of deteriorating the relative unit labor cost, the second term represents the cost to the government when the unemployment rate and the inflation rate are off their targets, and the last term characterizes the cost to union workers when the real wage-growth rate falls or the unemployment rate rises.

The resulting optimal wage-growth rate responds to changes in economic conditions according to the following rule of reaction:

$$\begin{aligned}g_{\mathrm{w}} = {} & \frac{A_1}{A_0} + \frac{A_2}{A_0}\pi_{\mathrm{Nop}} + \frac{A_3}{A_0}g_{\mathrm{NEER}} + \frac{A_4}{A_0}g_{\mathrm{w}-2} \\ & + \frac{A_5}{A_0}\pi_{-2} + \frac{A_6}{A_0}\pi_{\mathrm{OP}-2} + \frac{A_7}{A_0}g_{\mathrm{w}-3} \\ & + \frac{A_8}{A_0}\pi_{-3} + \frac{A_9}{A_0}\mathrm{CPFC} + \frac{A_{10}}{A_0}\hat{U} + \frac{A_{11}}{A_0}\hat{\pi}\end{aligned} \tag{47.10}$$

where $A_j (j = 0,1,\ldots, 11)$ are the functions of the structural parameters in the inflation equation, the unemployment-rate equation, and the unit-labor-cost growth equation; and the relative weights in the NWC's loss function (Equation (47.9)). The values of these coefficient functions (A_j's) are sensitive to the model's economic structure.

The other policy-game player, the MAS, manipulates the exchange rate to improve the tradeoff between the imported inflation and the international competitiveness of Singapore's goods and services,[13] which depends upon the real effective exchange rate, i.e. the relative unit labor cost in this article. Although the benefits of currency depreciation to the export sector can be lost to imported inflation and the resulting wage-price spiral that builds up in the medium-term horizon of three or more years,[14] maintaining a strong currency is detrimental to the export sector in the short run.

Let g_{E} be the actual real appreciation rate, which equals $(1-\theta)g_{\mathrm{w}} + \theta\pi + g_{\mathrm{NEER}} - g_{\mathrm{ULC^f}}$, $\hat{g}$ the real appreciation rate targeted by the MAS, and δ the weight loss of the deviation of the inflation rate from its target relative to the deviation of real appreciation. The MAS selects the nominal appreciation rate, g_{NEER}, to minimize its loss function:

$$\mathrm{Loss}_{\mathrm{MAS}} = \frac{1}{2}(g_{\mathrm{E}} - \hat{g}_{\mathrm{E}})^2 + \frac{\delta}{2}(\pi - \hat{\pi})^2 \qquad (47.11)$$

The first-order condition generates the MAS' rule of reaction:

$$\begin{aligned} g_{\mathrm{NEER}} = {} & \frac{B_1}{B_0} g_{\mathrm{ULC^f}} + \frac{B_2}{B_0} g_{\mathrm{w}} + \frac{B_3}{B_0} g_{\mathrm{w}-2} + \frac{B_4}{B_0} \pi_{-2} \\ & + \frac{B_5}{B_0} \pi_{\mathrm{NOP}} + \frac{B_6}{B_0} \pi_{\mathrm{OP}-2} \\ & + \frac{B_7}{B_0} \hat{g}_{\mathrm{E}} + \frac{B_8}{B_0} \hat{\pi} \end{aligned} \qquad (47.12)$$

where B_k's ($k = 0, 1, \ldots, 8$) are functions of the structural parameters and weights as A_j's in Equation (47.10).

In this model, the Nash game requires that a policy-making institution react to the optimal policy move made by the other policy-making institution as well as to the state of the economy. At the equilibrium, each institution's policy response is the best not only for the economy but also for the optimal policy of the other institution. Simultaneously solving the system of two non-Nash policy response functions, i.e. Equations (47.10) and (47.12) with the estimated structural coefficients, produces the Nash equilibrium characterized by the Nash appreciation rate of NEER (g^*_{NEER}) and Nash wage-growth rate (g^*_{w}) (both in their implicit forms) below:

$$\begin{aligned} g^*_{\mathrm{w}} = f(& \pi_{\mathrm{NOP}}, g_{\mathrm{ULC^f}}, \pi_{\mathrm{OP}-2}, g_{\mathrm{w}-2}, \pi_{-2}, \\ & g_{\mathrm{w}-3}, \pi_{-3}, CPFC, \hat{g}_{\mathrm{E}}, \hat{U}, \hat{\pi}) \end{aligned} \qquad (47.13)$$

$$\begin{aligned} g^*_{\mathrm{NEER}} = h(& \pi_{\mathrm{NOP}}, g_{\mathrm{ULC^f}}, \pi_{\mathrm{OP}-2}, g_{\mathrm{w}-2}, \\ & \pi_{-2}, g_{\mathrm{w}-3}, \pi_{-3}, \mathrm{CPFC}, \hat{g}_{\mathrm{E}}, \hat{U}, \hat{\pi}) \end{aligned} \qquad (47.14)$$

In contrast, the non-Nash game simply takes feedback from the state of the economy over a set of current and lagged state variables. Under this rule, any policy variable under the control of one institution does not react to a policy variable under the control of the other institution, i.e. only the currently observed appreciation rate enters the NWC's reaction function, whereas only the currently observed wage growth rate enters the MAS's reaction function. By estimating the structural coefficients in the non-Nash policy response functions for the NWC and MAS (i.e. Equations (47.10) and (47.12)) the non-Nash game can be reduced to one in which the policy sensitivity depends only on the weighting parameters and policy targets.[15]

The stability of Nash equilibrium depends on whether the recursive relations determined by Equations (47.10) and (47.12) will yield a damped or an explosive time path of oscillation once the Nash equilibrium is disturbed. As shown in Wu (2004), the MAS response function (47.12) with estimated structural parameters is negatively sloped (for a reasonable value range of δ) and the similarly estimated NWC response function (47.10) is positively sloped and then the stability condition for the Nash equilibrium requires that the NWC response function be flatter than the MAS response function in the policy space (g_{NEER}, g_{w}). This condition is not satisfied, however. It, therefore, follows that with the appropriate estimates of structural parameters the Nash equilibrium is not stable and it is more meaningful to concentrate on the non-Nash equilibrium.

47.4. Complementarity of Non-Nash Wage Growth and Exchange-Rate Appreciation

Fixing the policy targets and assigning different values to the relative weights α_i, β, and γ makes it possible to simulate the computable time-paths of the non-Nash optimal appreciation rate, g_{NEER}, and the non-Nash optimal wage growth rate, g_{w}, over different economic scenarios. The purpose of simulation is to mimic non-Nash policy strategies and thus examine their sensitivity to the game-players' bargaining parameters and the policy stance.

There are three economic scenarios for simulation. In the benchmark case of Goldilocks economy (scenario 1), employees are equally concerned with real wage decline and unemployment ($\beta = -1$). The deviations from the government's targeted inflation rate are equally penalized as those from the targeted unemployment rate ($\gamma = 1$). And the MAS weights equally the deviations of the real exchange rate and inflation rate from their targeted levels ($\delta = 1$). In addition, the targeted rates of inflation and unemployment are, respectively, set at 2 and 3 percent, approximately, to reflect their long-term trend in the period; the targeted rate of real effective exchange-rate appreciation is chosen as 3 percent based on an eight-year moving average since 1988; and the targets specified above continue to apply to the other two economic scenarios. In a recession (scenario 2), the threat of recession prevents employees from demanding too much of real wage growth so that β falls in its absolute value ($\beta = -0.8$). The government's and the monetary authority's inflation weights assume a smaller value compared with the Goldilocks economy ($\gamma = \delta = 0.8$). The third scenario concerns an inflationary economy in which the monetary and fiscal authority weighs inflation more than the targeted real competitiveness ($\delta = 1.2$). In the NWC's loss function, the government's inflation target now also takes a greater weight than the unemployment target ($\gamma = 1.2$), and meanwhile, the inflation threat naturally raises the employees' concern with their real income ($\beta = -1.2$).

How do the growth rate of wages and the appreciation rate of exchange rates work together in Singapore? Table 47.1 presents the correlation coefficients between the NEER appreciation rate and non-Nash wage growth rate in all the three simulated scenarios as well as the actually observed correlation coefficient.[16] As in Table 47.1, all the simulation-based correlation coefficients are positive for the non-Nash regime. It follows that the two policies are complements in a non-Nash environment. Instead of responding optimally to each other, the non-Nash strategies work in such a way that at least one strategy acts independently without taking into consideration the intended target of the other. Hence, the two strategy variables tend to be relatively impartial in balancing and achieving their own targets. Furthermore, the observed positive correlation between actual wage growth and actual exchange-rate appreciation also matches the pattern for the simulated non-Nash outcome; it does so especially in scenario 2.[17]

Table 47.1. Correlation between Wage Growth and NEER Appreciation

		Non-Nash Game Simulation		
	Actual	Scenario 1	Scenario 2	Scenario 3
Correlation Coefficient	0.644	0.588	0.646	0.520

47.5. Concluding Remarks

Singapore government's commitment to and continuous participation in the annual tripartite collective bargaining over wage growth signifies the effectiveness of the NWC's adaptable stance and flexible wage policy in smoothing out business cycles, which detracts from the conventional wisdom on wage rigidity and its macroeconomic implications. This paper explores the manner in which Singapore policymakers deploy wage policy in coordination with its exchange-rate policy to achieve macroeconomic stability. The theoretical result from the Nash bargaining in the level of wages and exchange rates suggests that in the long run, wages increase one percentage point for about every percentage point appreciation in the exchange rate, which is well supported by the cointegration and error-correction analysis.

Furthermore, for the period studied, Singapore's tripartite collective bargaining (through NWC) in the growth rate of wages seems to have followed the non-Nash game practice as opposed to the Nash game, as the latter is unstable. A number of structural factors could have actually prevented the NWC from optimally reacting to the best move made by the MAS, such as asymmetry in the decision-making frequency (high frequency on the part of MAS vs. the low frequency on the part of NWC), asymmetric information between policy players as well as their overlapping interests, or simply any barrier in the institutional structure that makes a full-fledged interaction between policy players unrealistic. Both the non-Nash rule simulation and actual observations indicate that the Singapore dollar exchange rate appreciation has acted as a complement to wage growth. Indeed, Singapore currency has exhibited a clear trend of appreciation vis-à-vis a basket of foreign currencies during economic upturns while the growth of labor earnings are rising and a trend of depreciation during economic downturns while the wage growth are declining.

NOTES

1. In the euro area, particularly the familiar policy instruments like the exchange rate and money supply have ceased to be available at the national level while fiscal policy is also often constrained by the straitjacket that the budget deficit cannot exceed 3 percent of GDP, which renders more room for national wage policies (Calmfors, 1998; Wu, 1999; Lawler, 2000; Karadeloglou et al., 2000; Abraham et al., 2000).
2. The Council of Economic Advisers to the President in the US explicitly implemented income policies by imposing the general guidepost for wages from 1962 to 1965 for example (see Perry, 1967;Schultz and Aliber, 1966). The guidepost implicitly remained in practice from time to time in the 1970s as well. In the UK, the 1980s and 1990s saw a resurgence of interest in income policies due to rising unemployment. For an argument for wage policy, see Hahn (1983, p.106).
3. The average annual GDP growth in Singapore over the last decade was greater than 7.5 percent, with an inflation rate of about 2 percent per year.
4. Singapore's system of national wage council has distinguished itself from the centralized collective bargaining in European countries in three aspects. First, unlike the intermittent European government involvement in wage negotiations, the Singapore government has continuously committed to its participation in the yearly tripartite wage-policy dialogue and agreements since the NWC was formed in 1972. Second, the smooth cooperation between union and nonunion workers and the NWC's effective tripartite coordination resulted in relatively small wage drifts (wage increases beyond those agreed upon in the central negotiations), which are in sharp contrast to the large wage drifts in Europe. Third, serving endogenously as an integrated part of Singapore's macroeconomic management strategy, the NWC has reduced government reliance on exogenous instruments such as fiscal policy and other nonwage income policies, whereas many European governments normally approach interventions from outside the labor market.
5. For a longer and more detailed version of the model discussed in this section, see Wu (1999). The author gratefully acknowledges the permission granted by Blackwell Publishing in this regard.
6. For the right-to-manage model, see Nickell and Andrews (1983) and Oswald (1985).
7. For a similar formulation of the loss function, see Barro and Gordon (1983), and Agénor (1994).
8. The mathematical results of dynamics as well as comparative statics are available from the author upon request.
9. The augmented Dicky–Fuller values for LULC, LNEER, and LIMP are all below the 10 percent MacKinnon critical value in absolute terms.
10. With one standard-deviation innovation in import prices (LIMP) leading to a positive response of unit labor cost (LULC) and a negative response of the exchange rate (LNEER), both responses peak almost simultaneously at the fourteenth quarter after the shock; after that, both of them show a tendency to decay. Consistent with the cointegrating relationship discussed earlier, the pattern in which the wage response mirrors inversely the exchange rate response holds uniformly for all the possible orderings of the Choleski decomposition.
11. With kind permission of Springer Science and Business Media, the author has drawn on a longer version of Wu (2004) in the writings of this section and the next.
12. For the modeling and econometric specification of unit labor cost equation as well as price equation and unemployment equation, see the appendices in Wu (2004).
13. See Teh and Shanmugaratnam (1992) and Carling (1995) for the analyses of Singapore's monetary policy via exchange-rate targeting.

14. See Low (1994).
15. See Wu (2004).
16. For a given simulated scenario, the correlation coefficient does not vary with different bargaining cases because the parameters that reflect bargaining power are constant over time and they do not appear in the coefficients of any time-series variables in either Equation (47.10) or Equation (47.12).
17. Clearly, scenario 2 (recession) cannot characterize the 1987–1995 period in Singapore. The closest match of the simulated correlation with actual correlation in the scenario only suggests that there are some similarities between a recession period with low inflation or deflation and a high-growth period with low inflation. However, the simulation that is based almost exclusively on inflation-related parameters cannot distinguish one from the other.

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