Hong Kong Monetary Authority

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MACROECONOMIC IMPLICATIONS OF US INTEREST RATES FOR HONG KONG

Key points :

- *Signs of US economic recovery has brought its interest rate policy to the forefront, giving rise to questions as to when and by how much will the Federal Reserve raise short-term interest rates. This paper estimates an equilibrium US short-term interest rate and assesses macroeconomic implications of potential rate increases for Hong Kong.*

- *Our estimates suggest that the equilibrium US federal funds rate is significantly higher than the current level. Nonetheless, our estimates of the Taylor rule indicate that the Federal Reserve is more responsive to inflation than to output, and gradualist in adjusting the policy rate.*

- *While increases in US interest rates may lead to an appreciation of the US dollar, they are presumably due to a sustained and robust recovery of the US economy. Simulations of a small macroeconomic model of Hong Kong suggest that the positive effect of the increase in external demand would more than offset the adverse impact of the rise in interest rates.*

Prepared by: Jiming Ha and Cynthia Leung
Economic Research Division
Research Department
Hong Kong Monetary Authority

I. INTRODUCTION

The prospect of a recovery of the US economy raises questions as to when and by how much the Federal Reserve will raise short-term interest rates. This paper considers the prospects of a rise in US interest rates by estimating the equilibrium US short-term interest rate, and analyses implications for Hong Kong based on simulations of a small macroeconomic model.

The rest of the paper is organised as follows. Section II briefly discusses market perceptions of US interest rate outlook. Section III provides a brief review of methodologies for estimating real equilibrium interest rates. Section IV estimates an equilibrium US short-term real rate and discusses the implications for US interest rate outlook. Section V considers macroeconomic implications of a higher interest rate on the Hong Kong economy, and conduct policy simulations using a small macroeconomic model. Section VI provides concluding remarks.

II. MARKET

Signs of a US economic recovery have emerged in recent months. Having contracted by an annualised rate of 1¼% in the third quarter of 2001, growth picked up by 1¾% in the fourth quarter of 2001 and surged to 5¾% in the first quarter of 2002. Industrial production grew for the third consecutive month in March. The Consumer Confidence Index rose by around 30% in the past six months. The Institute for Supply Management's (ISM) indices of manufacturing and non-manufacturing sectors trended up sharply during February-April. The Chicago Purchasing Managers' Report also showed a third straight month of expansion in April. Amid these positive developments, the consensus forecast for US growth outlook of 2002 has been revised significantly upwards from below 1% in late last year to above 2½% in April 2002, while the forecast for unemployment rate has been revised downwards from over 6% to below 5¾% (Chart 1). The dispersions of the consensus forecasts have been narrowed as well. Yet, the consensus forecast of annual growth implies an expectation of a slower pace of growth in the next three quarters. The Federal Reserve left the Fed Funds rate unchanged at the May FOMC meeting, and reiterated a balanced assessment of economic growth and inflation prospects, but noted uncertainties about a strengthening in final demand over the coming quarters.

While market perceptions of US rate increases are far from unanimous, market participants seem to have expected that the Federal Reserve would keep its federal funds overnight bank lending rate at the current level in the first half of the year and begin to raise it in the second half. This perception is evidenced by the changes in the federal funds futures, which trended up in recent months, apparently pricing in a tightening of the US short-term rates by some 75 basis points by the end of the year (Chart 2). The consensus forecasts of the 3-month and 10-year Treasury bonds increased by 50-100 basis points between November and April.[1] Furthermore,

[1] A change in the US fiscal outlook probably also played a role in influencing long-term interest rates. Tax cuts, the weakening in economic activity, and the sharp decline in stock prices has reduced tax receipts. Increased funding for defence and homeland security and higher expenditure on unemployment benefits and other cyclical sensitive programs are also pressing on the budget.

according to a poll of 21 primary dealers who transact directly with the Federal Reserve, none expects the latter to raise interest rate at its next meeting in June, and the vast majority —16 out of 21—expect the first tightening to take place in August.

Chart 1. Signs of US Economic Recovery

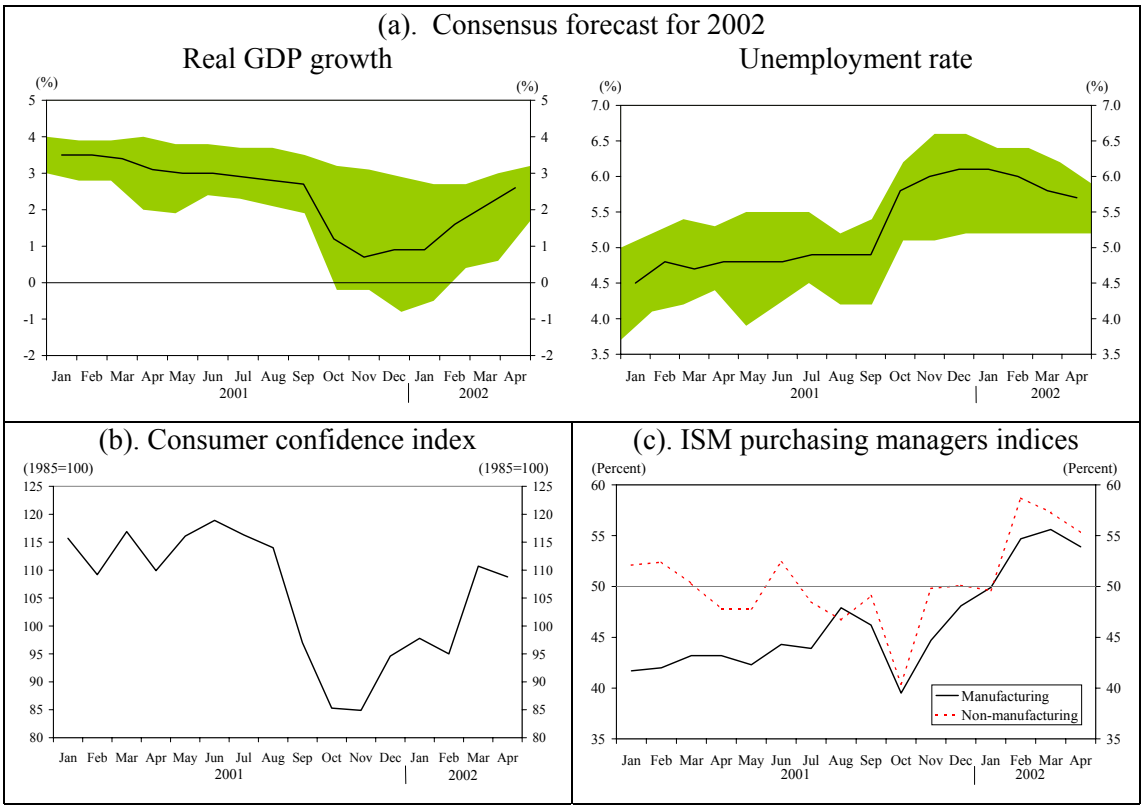
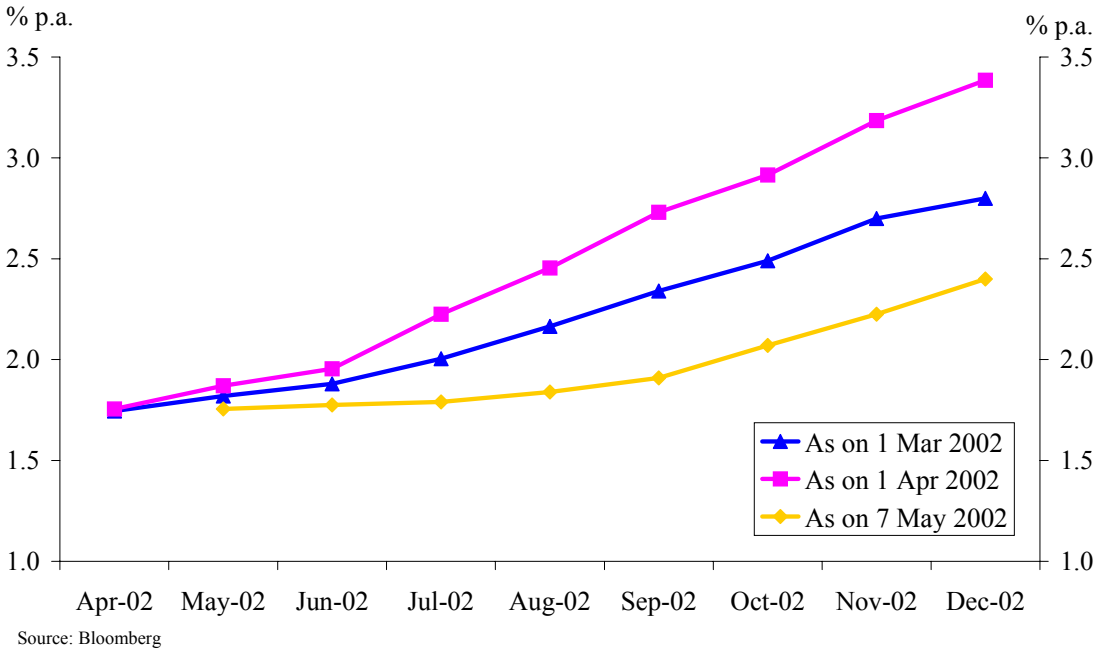


Chart 2. Implied Fed Funds Rates
(Derived from Federal funds futures contracts)



Source: Bloomberg

III. METHODOLOGY

A key variable for the conduct of monetary policy is the equilibrium or natural rate of interest, which is typically defined as the real interest rate that would prevail if the economy were on its long-term equilibrium path with price stability and full employment. In the US and many other countries, the short-term interest rate is the primary policy instrument, and its gap with the equilibrium level provides a measure of the policy stance.

However, equilibrium interest rates are unobservable and must be estimated. Existing approaches for estimating equilibrium real interest rates can be broadly grouped under three main headings: financial-market-based approaches, structural-model approaches, and reduced-form methods.

Financial-market-based approaches are designed to extract information about the (unobserved) equilibrium real rate from observed spreads between short- and long-term interest rates. The spread between short- and long-term interest rates is commonly used as an indicator of the stance of monetary policy and the economic outlook (for instance, Estrella and Mishkin (1998) and the references therein). One possible interpretation for this practice, suggested by Bernanke and Blinder (1992) and Laurent (1998), is that longer-term interest rates embed market participants' best forecasts of where short-term rates are likely to head in the future. Thus, the yield curve steepens as short-term interest rates are perceived to be below their equilibrium levels and flattens when the reverse is true. While the term-spread approach has the advantage of being relatively free from the assumptions that complex econometric models cannot do without, long rates may rise and fall relative to short rates for reasons other than a changing differential between actual and equilibrium short-term interest rates. For instance, portfolio adjustment by major market participants in favour of shorter-term financial assets may cause the yield curve to trend up. Thus, term spreads provide only an indirect way to gauge the difference between actual and equilibrium interest rates, and require careful analysis of the sources of movements in the spreads.[2]

Structural-model-based measures of equilibrium interest rates may overcome the limitations of the term-spread approach by allowing for systematic accounting of the sources of movements in equilibrium interest rates. Measures of equilibrium real interest rates can be derived from economic models of the relationships between (unobservable) equilibrium interest rates and (observable) macroeconomic variables, as in Bomfim (1998) and others. However, the model-based approach has its own limitations. First, structural models that are able to generate reasonable estimates of equilibrium real interest rates tend to be large and complex. Secondly, and unsurprisingly, model-based estimates of the equilibrium interest rate are only as good as the analysis underlying the model.

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[2] Bomfim (2001) presents an approach for deriving equilibrium real interest rates from yields on the US Treasury's inflation-indexed securities (TIIS). It could potentially overcome some of the drawbacks of the traditional term-structure spread approach. But a significant impediment to taking this approach is the sparseness of TIIS yield curve, which effectively is made up of a small cluster of points around the ten-year maturity and an even smaller number of yields close to the thirty-year maturity.

Simpler methods for measuring equilibrium real rates range from computing historical averages of real interest rates—under the assumption that, on average, actual rates are at or near their equilibrium values—to techniques based on the estimation of small-scale, reduced-form systems. A typical approach involves using "Taylor rule" (Taylor (1998)), which links the deviation of the real interest rate from the equilibrium level to the output gap and the deviation of expected inflation from the target. The Taylor-rule approach views the monetary authority's interest rate setting decision as that of determining an appropriate level for real short-term interest rates given expected path of inflation and the output gap. While the monetary authority does not use a simple formula to set interest rates, the Taylor rule has become a standard benchmark to assess the stance of monetary policy. It is aimed at "revealing" the equilibrium interest rate by analysing the conduct of monetary policy of the past, predicated on the notion that the monetary authority has been able to use the policy rate as a tool to respond to business cycles in a counter-cyclical manner in accordance with the Taylor rule. When the economy is in equilibrium, so is the interest rate.[3]

Each of the approaches discussed above has its strengths and weaknesses. Some are more direct measures of equilibrium real rates than others, and they all vary in the extent to which they depend on the theoretical priors of the analysts. The Taylor-rule approach, which we apply below, has been most widely used in recent years.

IV. ESTIMATING US EQUILIBRIUM INTEREST RATES

This section estimates the equilibrium federal funds rate, using the Taylor rule, which can be written as

$$r_t - r^* = \alpha(\pi^e_{t+1} - \pi^*) + \beta gap_t \qquad (1)$$

where,

r: real federal funds rate
π^e: expected inflation rate
gap: output gap
*: equilibrium or desired level

The parameters α and β measure the Federal Reserve's assumed responses to expected inflation and output gap, respectively. These parameters and the equilibrium real interest rate, however, are unobservable and need to be estimated.

Using equation (1), the Taylor rule for the nominal interest rate can be derived. Specifically, since the real interest rate is defined as the difference between nominal rate (i_t) and expected inflation rate,

[3] Another example of reduced-form approach is the work of Laubach and Williams (2001), who use the Kalman filter and a two-equation system relating US GDP behaviour to short-term real interest rates to generate an equilibrium real federal funds rate series.

$$r_t = i_t - \pi^e_{t+1}, \tag{2}$$

substituting (2) into (1) yields,

$$i_t = (r^* - \alpha\pi^*) + (1+\alpha)\pi^e_{t+1} + \beta gap_t. \tag{3}$$

Equation (3) relates the federal funds rate to expected future inflation and the current output gap. According to this rule, the Federal Reserve controls the path of the nominal interest rate to correct for deviations of expected inflation and real output (the feedback variables) from the desired inflation rate and potential output (the policy goals). Higher values of α (β) imply a more aggressive policy response for a given inflation deviation (output gap). The constant term embeds both the desired level of inflation and the underlying real rate of interest.

Using data on the nominal federal funds rate, inflation expectation, and output gap, we can estimate responses of the interest rate to inflation and output gap, and calculate the equilibrium real interest rate from the estimate of the constant term after adjusting for the desired rate of inflation. We include one lag of the federal funds rate to capture the smooth factor.

$$i_t = (1-\lambda)[(r^* - \alpha\pi^*) + (1+\alpha)\pi^e_{t+1} + \beta gap_t] + \lambda i_{t-1} \tag{4}$$

This is because the Federal Reserve attaches a cost to interest rate variability, reflecting (i) concern about the impact of excessively volatile interest rates on financial stability; (ii) uncertainty about the model parameters or the model itself; and (iii) serial correlations of the shocks, to which the Federal Reserve responds. The coefficient of the lagged interest rate (λ) indicates the degree of instrument smoothing, which, in turn, dictates the speed at which the interest rate converges to equilibrium.

Assuming an equilibrium inflation rate of 2-2½%, our estimates suggest an equilibrium real interest rate of 1¾-2½%, and an equilibrium nominal rate of 3¾-5% (Box A).[4] Thus the current level of the federal funds rate may be 200-325 basis points below equilibrium, suggesting that the FOMC is likely to raise interest rates as economic activity rebounds. Furthermore, our estimates of the parameters of the Taylor rule indicate that the Federal Reserve is probably more aggressive on inflation than on output, and gradualist in adjusting the policy rate.[5]

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[4] The assumed equilibrium inflation rate is in line with the average PCE inflation rate from the early 1990s to the present.

[5] It should be noted that these estimates are subject to considerable uncertainties due to a number of factors. In particular, the assumption of a constant equilibrium real interest rate may be questionable given the possibility of structural changes in the US economy, particularly the increase in productivity in the past decade. Moreover, the assumption of 2-2½% for the desired rate of inflation, which is based on the actual inflation of the past decade, may not represent the equilibrium inflation path of the future.

Box A. Estimating the Taylor Rule

Quarterly data from 1990 to the present are used. The output gap is calculated using estimates of potential output by the US Congressional Budget Office. Data on expected inflation of private consumption expenditure (PCE) are derived from survey data compiled by the University of Michigan.[6] The estimate of α is significantly greater than β, suggesting that the federal funds rate has been more responsive to inflation than to output gap (Table A1). The coefficient of the lagged interest rate variable (λ) indicates that the smooth factor plays an important role. Specifically, the half-life of the smooth factor, which is estimated as –log(2)/log(λ), suggests that discrepancy between the actual and equilibrium rate would be reduced by half in about 2-3 quarters, provided that inflation and output stay at the desired and potential level.

Our estimates of the equilibrium federal funds rate and the feedbacks in the Taylor rule are broadly in line with the results of other studies. In particular, Meyer (2002) suggests that the equilibrium real and nominal federal funds interest rate at present are around 2½% and 4-4½% respectively. Morgan Stanley (2002) argues that the equilibrium nominal federal funds rate should be about 4-4½%. William's (1999) estimates of the Taylor rule and the IMF's (2002) estimate of the response of the federal funds rate to the inflation gap are close to ours.

Table A1. Estimation of Taylor Rule and Equilibrium Interest Rate

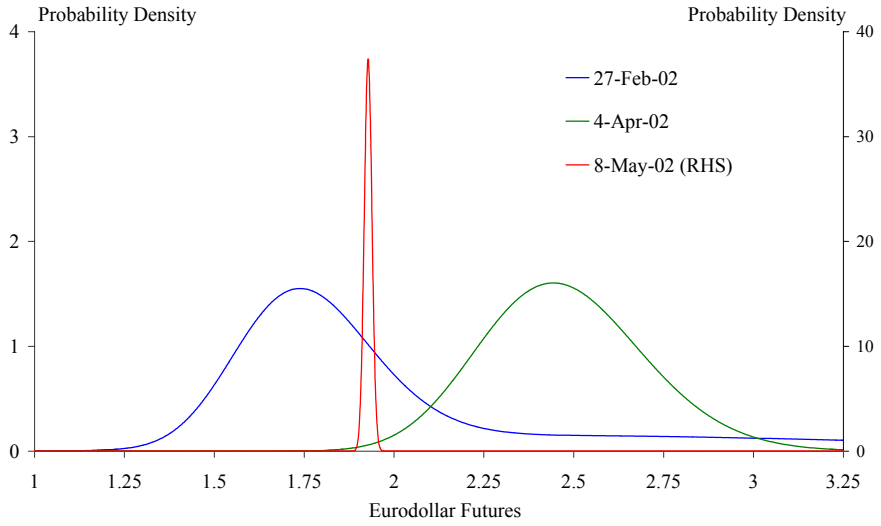
	HKMA	IMF	Taylor*	Williams	Meyer	Morgan Stanley
Taylor rule						
- Sample period	1990-present	1982-present	-	1980-1997	-	-
- α	1.48	1.51	-	1.24	-	-
- β	0.77	0.25	-	0.71	-	-
- λ	0.72	0.82	-	0.83	-	-
Equilibrium federal funds rate						
- Real	1.75 - 2.49	-	2.00	1.53 - 2.15	2.50	2.50
- Nominal	3.75 - 4.99	-	4.00	3.53 - 4.65	4.00 - 4.50	4.00 - 4.50

* Taylor(1993) assumed equal weights for output and inflation gaps.

[6] The Federal Reserve macroeconomic model (FRB/US) uses PCE chain-type price index to measure inflation. The model has been used to guide and support US monetary policy.

Our results are similar to the findings by other researchers, as shown in Box A, and support the view that significant increases in the federal funds rate are probably not in the immediate offing. Estimates of probability density functions based on the three-month Eurodollar futures options suggest that a rate hike in June appears unlikely following the FOMC meeting of 7 May (Chart 3).[7]

Chart 3. Probability Density Functions for June 2002 Contract



A number of considerations point to caution by the Fed to raise interest rates at this stage. The recovery can be sustained only if corporate investment recovers and consumer spending stays buoyant. With plenty of slack capacity around and many firms facing disappointing profits, it is yet to be seen when investment will register a sustained rebound. Because consumer spending held up well during the downturn—largely owing to the sharp increases in house prices in response to interest-rate cuts—the potential for a significant acceleration in consumption growth is limited, considering particularly the relatively high unemployment rate. A sharp tightening of the monetary policy would risk aggravating labour market conditions and causing a sudden reversal in housing prices, both of which will harm the recovery. Furthermore, inflationary pressures remain quiescent, although US consumer prices have ceased falling on a monthly basis. Indeed, given the pressure on profit margins and weak pricing power of firms, the Fed might be less concerned about a moderate increase in consumer prices than otherwise would be the case.

V. IMPACT ON HONG KONG

An increase in US short-term interest rates typically implies higher interest rates in Hong Kong due to the linked exchange rate system, although the exact magnitude and timing of the increase could be influenced—to some extent—by the liquidity condition of the local market. To assess the impact of a rise in interest

[7] See Yu, Tang and Sze (2002) for a description of the methodology.

rates on the Hong Kong economy, it is useful to briefly review the transmission mechanism through which a change in real interest rate can affect activity.

First, changes in the real interest rate impact household spending through wealth effects and intertemporal substitution effects.[8] Wealth effects arise because higher real interest rates lower asset prices, inducing increases in household savings. Intertemporal substitution occurs because of the resulting change in the relative cost of purchasing goods now versus later. It is important to note, however, that the possibilities for intertemporal substitution vary widely across goods—the public may well defer purchases of durable goods, such as cars, if the price is expected to fall, but are much less likely to postpone consumption of nondurables and services. This distinction is important in view of Hong Kong's economic structure, which is heavily weighted towards services rather than goods production. As a result, intertemporal substitution is likely to have only a moderate effect on the demand for Hong Kong's output.

Secondly, business investment is determined by the yield on capital net of cost. The real cost of capital is equal to the real interest rate plus the depreciation rate. Increases in the real cost will drive up the required rate of return on investment, thus depressing investment. Thirdly, the Hong Kong dollar is likely to appreciate in effective terms along with the US dollar, reducing the competitiveness of our exports.

However, significant increases in US interest rates are most likely due to a sustained and robust recovery of the economy and a rise in inflationary pressures, as noted above. This should boost US imports and also help elevate global demand and world prices, which will benefit the Hong Kong economy. Specifically, an increase in external demand will provide a spur to domestic economic activity through the trade channel, narrowing the output gap. This and a possible increase in world prices would reduce deflationary pressure, attenuating the effects of increases in nominal interest rates. Our econometric analysis finds that output in Hong Kong is less responsive to interest rates than to external demand, a typical result for a small open economy with no (net) external debt.[9]

It is therefore important to quantify the effects of these countervailing factors (higher interest rate and effective exchange rate versus stronger external demand and possibly higher world prices) and assess the overall impact. To this end, we conduct simulations using a recently constructed small macro-econometric model of the Hong Kong economy. The transmission mechanisms through which a change

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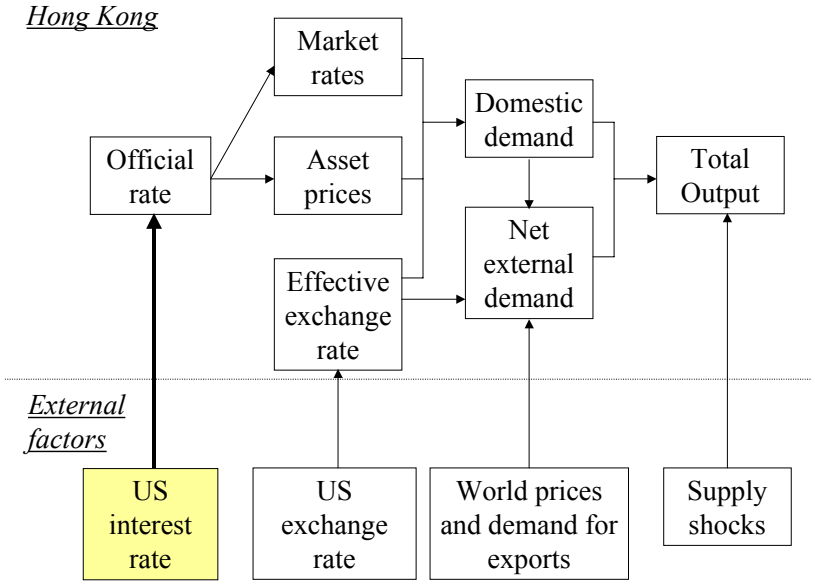
[8] There can be an additional channel due to income effects. Higher real interest rates tend to raise household income, as the household sector as a whole is typically a net creditor. However, changes in income from interest rate movements will sum to zero for the economy as a whole, including the corporate and government sectors, as there is a lender for every borrower. Of course, there could be a positive income effect due to a net foreign asset position vis-à-vis the foreign sector, but the size of it should be moderate.

[9] For an economy with net external debt, there would be a negative income effect due to a rise in interest rate.

in interest rate affects Hong Kong's output as embodied by the model are shown in Chart 4.

Chart 4. Transmission Mechanism of Interest Rate



The simulations are in the nature of "shock-minus-control" experiments, as they represent the effects of shocks relative to a baseline case, in which US interest rates are unchanged. To carry out the simulations, the US federal funds benchmark interest rate is assumed to be raised gradually by 50-100 basis points by end-2002, as suggested by prices of federal funds futures contracts (Chart 2).[10] This is to be matched by a rise of interest rates in Hong Kong. The nominal effective exchange rate (NEER) is assumed to rise by ½%-1% accordingly, in light of the experience of the previous cycle of US monetary tightening. External demand is assumed to be ½% higher than the baseline—in line with the change between December and April in IMF's WEO projections of world output growth, and 1¼% higher for 2003.

Our simulation results suggest that the positive effect of the increase in external demand more than offsets the negative effect of the rise in interest rates and the appreciation of the NEER. Specifically, output is projected to increase by a cumulative ¼% and unemployment rate to decline by one tenth of a percentage point by the second quarter of 2003 (Chart 5).[11] The overall impact on prices is projected to be marginal. Thus, overall there would be a moderate positive effect on Hong Kong. This seems to support the view that external demand plays a more important role than interest rates in affecting the Hong Kong economy. That view is evidenced, to a

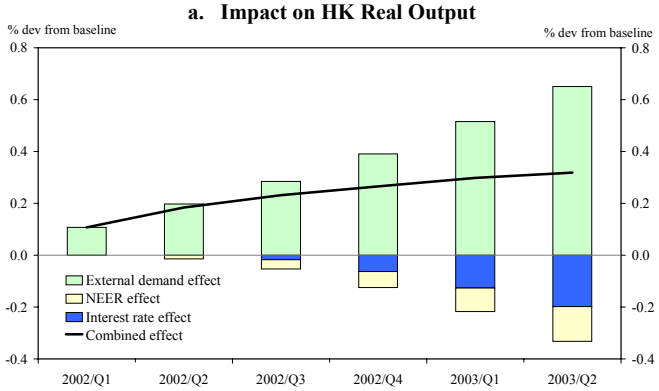
[10] It should be understood that the assumed increase in the federal funds rate does not represent a forecast of US interest rate policy.

[11] The simulation results need to be interpreted with caution because of uncertainties about the assumptions and the simplicity of the model.

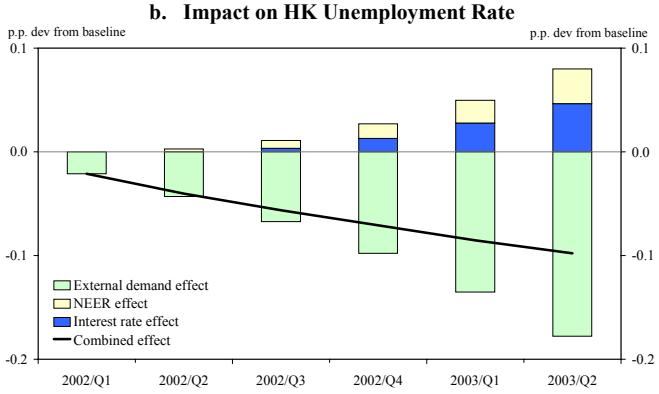
degree, by the strong growth in 2000 in the face of a significant tightening of US monetary policy, and weak performance in 2001 despite a sharp decline in interest rates.

Chart 5. Simulation Results
(Cumulative deviation from baseline)

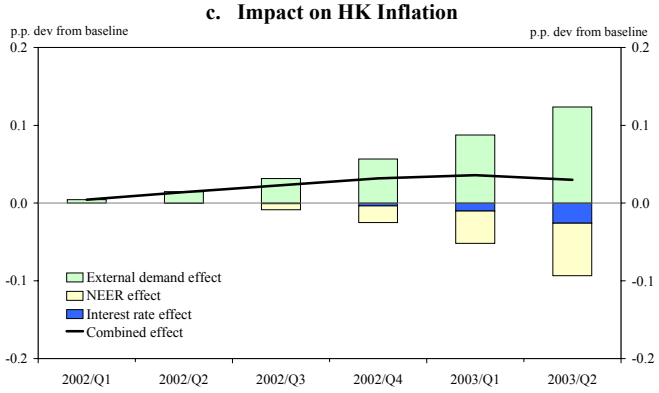
a. Impact on HK Real Output



b. Impact on HK Unemployment Rate



c. Impact on HK Inflation



VI. CONCLUDING REMARKS

We estimate an equilibrium federal funds rate to be 1¾-2½% in real terms and 3¾-5% in nominal terms, substantially higher than the current level of 1¾%. Nonetheless, the estimates of the Taylor rule suggest that the Federal Reserve is more aggressive on inflation, less responsive to the output, and gradualist in adjusting the policy rate.

An increase in US short-term interest rates will directly affect the Hong Kong economy through the interest rate channels due to the linked exchange rate system. However, a rise in the federal funds rate is most likely due to a sustained and robust recovery of the economy and rising inflationary pressure, which will help elevate world demand and benefit the Hong Kong economy. Assuming a rise in US interest rates in line with prices of federal funds futures contracts and an increase in US output as the IMF recently projected, our simulation results suggest that the positive effect of the increase in external demand is likely to more than offsets the negative effect of the rise in interest rates.

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