

Deflation in Hong Kong: An Assessment

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September 6, 2002

1 Introduction

The general price level in Hong Kong started to fall in October of 1998. Since then the price level has fallen by a cumulative of 12 percent, bringing the average consumer prices back to their 1995 level.

Deflation has persisted for more than 3 years, and is generally expected to continue in the near-term. What are the causes of deflation and its persistence? When will it end?

There are two main causes: a sharp and protracted downturn of the business cycle and structural change of the economy in response to the opening of China and its gradual integration with Hong Kong.

The Asian region was hit by two successive negative macroeconomic demand shocks in the past 5 years: the Asian Financial Crisis started in 1997 and the global economic slowdown in 2001. The macroeconomic downturn has contributed to cyclical deflationary pressure in Hong Kong.

The bursting of the property price bubble following the onset of the Asian Financial Crisis is an important cause of cyclical deflation. The damaged balance sheets of many companies and households contributed to the persistence of the deflation cycle through a negative effect on consumption. While the process is self-limiting, however, once deflationary expectations become entrenched, adjustment can be very sluggish in the absence of strong positive signals of economic recovery.

The integration of Hong Kong with China has made it more convenient for companies to move their operations across the border. This effect by itself leads to structural inflation as was witnessed in the decade before the Asian Financial Crisis. However, when it is combined with a severe regional or global recession it can also be deflationary as returns from overseas assets fall. Consumption and even investment will be negatively impacted.

The gradual and continued opening of China has also contributed to structural deflationary pressures in Hong Kong because it is now more convenient for households to consume across the border.

What are the respective importance of cyclical versus structural factors in explaining deflation and its persistence in Hong Kong is the subject of this study.

2 Persistent Deflation

Hong Kong is not alone in suffering from deflationary pressure. China, Taiwan, Singapore and Japan are also facing falling prices. Unlike the 80's when the developed economies were ravaged by inflation, the 90's witnessed the taming of the inflationary spiral. Inflation in Asia, excluding Japan, dropped from close to 20% in 1994 to around 2.5% in 2001. Hong Kong was not immune from the disinflation process in the 1990's, with inflation rate dropping from 11% in 91Q1 to 2.8% in 98Q3. The drop in import prices has been a contributing factor in the fall of consumer prices in Hong Kong. Between 1998 and 2001, import prices declined by 12%, reflecting a 10% appreciation of the nominal effective exchange rate index.

The current prolonged drop in the price level is unprecedented in the postwar history of Hong Kong. The Composite Consumer Price Index started to fall in October 1998, and since then, has declined continuously for 45 months. From September 1998 to July 2002, the price level has fallen cumulatively by 12 percent, bringing the average consumer prices back to their 1995 level. As shown in Table 1, all major components of the CPI except transport and miscellaneous goods have declined in prices. The housing component alone has been responsible for 57% of the deflation during this period. Three other components, namely, food, clothing and durable goods accounted for 41% of the decline in the price level.

Table 1: Accounting for Deflation by Major CPI Components

	Cumulative change Sep 1998 – Jul 2002	Weight in overall CPI (percentage)	Contribution in overall deflation (percentage points)	Contribution to overall deflation (share)
All Items Index	-12.10	100.00	-12.10	100.00
Food	-7.20	26.67	-1.85	15.31
- Meals away from home	-4.02	16.39	-0.62	5.14
- Food, exclude meals away from home	-12.43	10.28	-1.28	10.54
Housing	-21.65	29.91	-6.90	57.01
Electricity, Gas and Water	-5.02	2.98	-0.14	1.12
Alcoholic Drinks and Tobacco	4.84	0.94	0.04	-0.35
Clothing and Footwear	-32.80	4.13	-1.71	14.13
Durable Goods	-21.68	6.24	-1.38	11.37
Miscellaneous Goods	3.07	5.70	0.16	-1.35
Transport	1.91	9.01	0.16	-1.31
Miscellaneous Services	-3.62	14.42	-0.49	4.08

The onset of deflation in Hong Kong was preceded by the collapse of property prices in the first half of 1998. The residential property price index dropped by 9%

year-on-year in 98Q1, 29% in 98Q2, 49% in both 98Q3 and 98Q4. After the sharp initial correction, property prices have continued to fall, albeit at a slower pace, resulting in a cumulative fall of 57% since the peak in 97Q3. The current residential property price level is now back to its 1992 level. The concomitant fall in residential rentals is less dramatic, with a cumulative fall of only 39%.

The property bubble had been fueled by rapid productivity and wage growth in the tradable sector since the early 1990's, and exacerbated by speculative activities, particularly in the run-up to the handover in 1997 when average property prices jumped by around 40%. The Asian Financial Crisis started in 1997 triggered the bursting of the property bubble. Since then the world had been hit by successive negative demand shocks: the bursting of the tech bubble in 2000, the subsequent global economic slowdown and the 911 terrorist attacks.

The property market has also been affected by shifts in the policy stance toward land supply. The market perception after the handover was that the constraint on land supply in Hong Kong would be relaxed so as to keep land prices in line with economic growth. Coupled with the sharp increase in the construction of housing, both public and private, in 1998, the property market was headed for a major correction, even without the Asian Financial Crisis.

The sharp fall in property prices has wiped out a huge amount of the asset values in the private sector of Hong Kong. Peng et al (2001) estimate that the net housing equity in the private residential sector dropped by 53% from HK\$3.7 trillion in 1997 to HK\$1.8 trillion in 2000, i.e. from 2.4 times nominal GDP in 1997 to 1.4 times in 2000. Many households have to struggle with the problem of negative equity of their property. According to the HKMA, at the end of 02Q1, there were 67,500 cases of negative equity, amounting to 14% of all mortgage holders. They owed the banks a total of HK\$115bn or 21% of total outstanding residential mortgages. The situation has been improving. At the end of 2001, there were 73,000 cases of negative equity valued at HK\$125bn.

The more than 50% drop in net private housing equity is a major cause of the weakness of private domestic demand. Both consumption and investment spending have been adversely affected. Peng et al (2001) estimate that a 10% drop in real property prices would reduce private consumption growth by about 1 percentage point, and that a 1 percentage point increase in the share of households facing negative equity would reduce private consumption by about 0.5%. 50% of the decline in private consumption spending in 1998 can be attributed to the fall in property prices.

The shrunken net worth also dampens the credit-worthiness of firms, thus reducing banks' willingness to lend. The private sector has also been reluctant to invest, given the state of the property market, and the uncertain economic outlook. The total outstanding bank loans have been shrinking since 98Q1.

The overall performance of the stock market has also been disappointing. This is not surprising given the huge exposure of the local stock market to the property sector. Furthermore, the bursting of the internet asset bubble had also wiped out a considerable amount of the asset wealth of the population, further dampening the incentive to consume and to invest.

The balance sheets of the private sector have sharply deteriorated over the past 5 years, and this takes time to repair. The falling aggregate demand hampers economic growth, dragging prices downward, and causing unemployment to creep upward to the recent high levels. The economy has only been propped up by external trade and government spending in the past couple of years. Faced with lackluster economic growth, high unemployment, falling prices and rising bankruptcies, confidence has badly been shaken up. The persistence in deflation has led the general public to form deflationary expectation, thus further weakening the already depressed level of domestic demand.

As a summary, the bursting of the property bubble preceded the deflationary process. The shrunken net worth of the private sector drags down the aggregate through the wealth and balance sheets effects. The sequence of negative shocks since the Asian Financial Crisis served to aggravate the bad situation by hurting sentiments and pulling down the performance of the external trade sector. With a better external environment, and given time for repairing private sector balance sheets, deflationary pressure in Hong Kong will moderate. The deflation rate did subside in 2000, dropping from 5.2% in 2000Q1 to 2.52% in 2000Q2, when the economy rebounded from the deep recession started in late 1998.

3 An Interpretative Framework of Structural and Cyclical Deflation

A framework for interpreting the current deflation is scientifically meaningful if it can also be applied to understand the decade of inflation that preceded the onset of the Asian Financial Crisis that started in 1997 and the subsequent global economic slowdown in 2001.

Standard macroeconomic analysis can provide a straightforward account of both inflation in the pre-1997 period and deflation in the post-1997 period for Hong Kong. This has been done in the previous section. How can structural interpretations of inflation and deflation be integrated with the cyclical analysis?

Our approach is to think of the Hong Kong economy as being composed of two sectors. One sector produces tradable goods (and services) and another sector produces non-tradable goods (and services). For the sake of expository convenience we do not develop a formal model here, although this could be done in a fairly straightforward manner. In the Appendix of this report we develop a graphical approach using supply and demand diagrams to provide a more technical exposition of the approach used in this study.

In the decade from the mid-1980s to the mid-1990s manufacturing operations were moved across the border and greatly expanded their scale of operation. Two effects took place in Hong Kong.

First, the manufacturing sector in Hong Kong experienced a huge increase in productivity relative to the rest of the economy, primarily the service sector. Since manufactured goods are predominantly tradable goods and many services are often

non-tradable, one can usefully think of the Hong Kong economy as having experienced faster productivity growth in tradable goods relative to non-tradable services. Prices of non-tradable services rose relative to tradable goods. Under the linked exchange rate, prices of tradable goods have to rise or fall in tandem with world prices; therefore, the domestic price level in Hong Kong (a combination of tradable goods and non-tradable services) began to rise faster than world prices. This is the cause and nature of structural inflation in Hong Kong. Structural inflation results from rising demand for non-tradable services that have to be domestically produced.

Second, returns from assets invested across the border in China resulted in a substantial rise in the incomes of Hong Kong residents above their domestically produced incomes. Part of the income arising from external sources had to be spent on non-tradable domestically produced services thereby further fuelling structural inflation. Consumption spending in Hong Kong would therefore rise faster than GDP during inflationary periods. This contradicts the common economic wisdom that consumption rises more slowly than GDP during an economic boom, because investment typically grows faster in a boom period compared with consumption. Figure 1 shows that in the decade from the mid-1980s to the mid-1990s the ratio of consumption to GDP was indeed rising.

Residential property is generally considered as a non-tradable service and could certainly be considered to be so during this period. It is therefore logical to find property price inflation to happen during this period. No doubt and inevitably market speculation in properties further fuelled property price inflation.

By the mid-1990s the expansion of manufacturing activities across the border was slowing, consequently structural inflationary pressure was eased. With the onset of the Asian Financial Crisis in 1997 and the subsequent global economic slowdown in 2001, the returns from assets invested externally also fell. Falling interest rates that took place later, and especially when the global economic slowdown emerged, is a good indicator of the declining returns from external incomes.

Recent estimates by the Census and Statistics Department of the net external assets of Hong Kong puts it at 138% of GDP in 2000 and 177% of GDP in 2001. Consider a decline in the interest rate by 3%. This would imply a decline in aggregate income derived from net external assets equivalent to about 4.1% of GDP in 2000 and 5.3% of GDP in 2001. These are huge declines in aggregate incomes and would obviously have a significant negative impact on domestic consumption of non-tradable services. Hong Kong began to experience deflationary pressure as a result.

It is important to note that the deflationary pressure caused by the decline in income from net external assets is not a simple case of structural deflation. The decline in income from net external assets is cyclical in nature and stems from the regional and global recession that started in 1997. The effect of this recession on Hong Kong is amplified by virtue of the very large net external assets of Hong Kong. This specific feature of the Hong Kong economy means that the effects of regional and global business cycles exacerbate the volatility of the economy.

The framework devised here can also be used to understand the implications of the “Gortex border” between Hong Kong and the Mainland on structural inflation.

The growing phenomenon of Hong Kong residents crossing the border to purchase a variety of consumption goods and services that were previously consumed domestically as non-tradable goods can be interpreted as a two-fold change. First, the ease of crossing the border from Hong Kong into the Mainland had transformed some non-tradable goods into tradable goods through a neighborhood effect. Second, this neighborhood effect reduced the demand for non-tradable goods in Hong Kong and resulted in a decline in their prices thereby contributing to structural deflationary pressures.

This process of structural deflation will stop when it is no longer economically worthwhile to engage in cross border consumption of this kind. This happens partly because prices across the border will rise over time. The process will also slow down with productivity gains in non-tradable goods in Hong Kong that will lower their prices.

Structural deflation of this sort may hurt the interests of those engaged in the production of non-tradable goods in Hong Kong, but they are positive for the economy as a whole because it allows the population to consume these goods at a lower price.

It is worth noting that the movement of production operations (both manufacturing and services) into China creates structural inflationary pressures that are opposite to the neighborhood effect of crossing the border for consumption purchases. Economic integration and the resulting structural change create both deflationary and inflationary pressures. It is likely that prior to the mid-1990s inflationary pressures dominate, but in the current environment deflationary pressures dominate.

Enhancing the flow of Mainland visitors into Hong Kong for tourism, work or residence would increase the demand for non-tradable goods in the SAR and would generate pressures for structural inflation. If the flow is sufficiently large then it could well dominate the deflationary pressures arising from cross border consumption activities.

4 Cyclical vs Structural

The persistence in deflation has been interpreted as a result of the structural transformation of the Hong Kong economy. This view is popular with the public, but empirical studies that we are aware of have shown that it is only a minor factor in explaining deflation in Hong Kong. In this paper we have attempted to provide a framework for analyzing this phenomenon and its interaction with macroeconomic cyclical effects in the previous section.

Structural transformation, in the sense of economic integration between Hong Kong and the Mainland, is not a post-1977 phenomenon. It was started when China adopted an outward orientation policy in 1978, and the process had accelerated since

the mid-80's, with Hong Kong's manufacturing base moving across the border and spreading out in the Pearl River Delta. As a result, Hong Kong had been transformed from a heavy-weight exporter of labor-intensive goods locally produced to a service-oriented economy. This story is well-known and has been told many times before.

The integration of the local economy with that of the Mainland has accelerated since 1997, as evident by, say, the sharp rise in the number of Hong Kong resident departures to the Mainland, now averaging around 150,000 a day. Many Hong Kong residents routinely travel across the border to consume. A sizable number are now living in Shenzhen, and quite a few have invested in properties in the Pearl River Delta.

After more than two decades of successful economic reforms, China is now an economic power house. Other cities in China are now Hong Kong's worthy competitors. Given the abundant supply of land and cheap labor across the border, Hong Kong might be eclipsed by the rising economic fortunes in the Mainland. This is the story of the "big dragon swallowing the small dragons".

It is not clear why the competition across the border has to be a zero-sum game. Even if the Mainland has absolute advantages in everything, Hong Kong must still have comparative advantages in some specific areas. This is the core lesson from trade theory. The important thing is to be able to seize on profitable opportunities, and focus on one's comparative advantages.

It is outside the scope of this paper to examine in details Hong Kong's competitive advantages. While not denying the obvious challenges posed by our neighbor, a piece of evidence can be offered to show that Hong Kong is still holding its own even in this difficult economic climate. Figure 2 shows the movements of the 10th, 50th and 90th percentiles of monthly earnings for full-time male workers from 85Q1 to 02Q1, and Figure 3 is the corresponding figure for female workers. As can be seen, the monthly earnings at the top end stayed flat since 1998, at the low end there had been a slight drop, while at the middle it was stable in the last 7 quarters, recovering from the minor fall in 2000. In other words, the real monthly earnings for many full-time workers who managed to hold on to their jobs had increased since 1998, instead of falling! Unlike property prices, nominal wages have been holding up across the earnings distribution for full-time workers.

The "structuralist" view of deflation is also not supported by other developments in the labor market. Figure 4 shows the unemployment rates by age groups. Unemployment rates rose across all age groups since 1998. The rates dropped in 2000 when the economy rebounded from the deep recession. The rates were substantially higher for the youngest age group. Those between 15 and 19 have an unemployment rate of 27.2% in 02Q1. Youth employment is known in the literature to be very pro-cyclical. The fluctuations of the unemployment rates in recent years are thus consistent with the cyclical view of deflation. The "structuralist" view would have a hard time explaining why young workers were hurt so much harder, and why the situation improved in 2000.

The average price gap between Hong Kong and its neighbours across the border is alleged to be the reason behind the persistent deflation in Hong Kong. Within

integrated markets, prices of similar products tend to converge. The price convergence process has been going on for quite sometime, with prices across the border catching up with those in Hong Kong. As their economies further develop, their non-tradable goods prices will rise further because the growth in demand for non-tradable goods would outstrip its supply, also known as the Balassa-Samuelson effect. It is thus not obvious why the price gap had to imply deflation in Hong Kong, rather than inflation rates across the border would be higher than the rates in Hong Kong.

Given their diversity, it is extremely difficult to compare prices of different goods. The Law of One Price that states that prices of identical products must be the same is fundamental to economics. Two identical products selling at different prices mean that there are arbitrage opportunities, which must be transient. After all, there cannot be 500 dollar bills lying around on the sidewalk without being picked up very quickly. A flat in Kingswood Villa in Yuen Long is now costing HK\$1,300-1,500 per square foot, while a flat at Le Parc in Futian is around HK\$800 per square foot (HSBC 2002). If the flats at Futian and Yuen Long were really comparable, the price differential would disappear in no time. The price gap between flats in Causeway Bay and Tuen Mun is over HK\$2,000 per square foot, and Causeway Bay has always been more expensive than Tuen Mun. Similar products can sell at large differentials because they have different bundles of characteristics, and they are not really similar.

Price level convergence cannot account for the sharp fall in prices because empirical studies have shown that the process only acts slowly. For example, using a panel of price indices for 19 cities in the U.S., spanning from 1918 to 1999, Cecchetti, Mark and Sonora (2000) find that price-level divergence across U.S. cities to be fairly large and persistent. Annual inflation rates over 10-year intervals can differ by as much as 1.6 percentage points, and that the half-life of convergence to be approximately 9 years. There is no evidence for the convergence rate to be faster after the World War II.

According to a recent study by HKMA, based on 300 products, Ha and Fan (2002) find that the average price differential between Hong Kong and 4 Mainland cities, namely Shenzhen, Guangzhou, Shanghai and Beijing, estimated to be around 20% in 2001, tends to reduce the overall price level in Hong Kong by less than 0.5% over a one-year period. Prices in Hong Kong and the four Mainland cities have been converging, albeit very slowly. The existing price differentials would be reduced by half in 6.5 years on the average.

The finding by Ha and Fan (2002) is consistent with the finding of a recent IMF study (IMF 2002). Using the ratio of the consumer prices indices in Hong Kong and Shenzhen as a measure of the average price gap, the study suggests that the price level gap plays only a minor role in explaining the deflation in Hong Kong. Cyclical factors, as proxied by unemployment rate, credit growth and the nominal effective exchange rate, are much more important determinants of deflation in Hong Kong. The three factors contribute 36%, 14% and 5%, respectively, to the explanatory power of the deflation equation estimated in the study. The price level gap contributes only 2%. It is also found that price convergence pressure had not increased after the collapse of the property market in 1997, nor after the onset of deflation in 1998.

The two studies by the IMF and HKMA do not support the “structuralist view”. Deflation in Hong Kong can be explained largely by the collapse of property prices and other cyclical factors.

5 Estimating a Model of Deflation

The general price level as measured by the Composite Consumer Price Index has been declining since October 1998. Persistent fall in consumer prices is unprecedented in the post-war history of Hong Kong. There seems to be a structural break in the data generation process for the price level in the fourth quarter of 1998. Before that, prices were increasing, and after that prices were falling. The important question is what can explain the falling price level, and whether there is a structural break.

In order to understand the movements of the price level, we construct an empirical model to study its dynamic properties. Instead of working with the price level, which is non-stationary, our dependent variable is the consumer inflation rate, approximated by the fourth-quarter logarithmic difference of the Composite Consumer Price Index. This measure has its drawbacks. It is strongly correlated over time, making it difficult to discern dynamic effects. The quarter-on-quarter changes are less correlated, but are noisier. The consumer price index is not as broad-based as the implicit GDP deflator. One-time drop in the price level brought about by administrative measures like rate rebates will appear as a worsening of the measured deflation rate for four quarters in a roll. Our choice of the dependent variable is largely motivated by the fact that the year-on-year percentage change of the consumer price index is the headline measure of inflation.

We adopt a Phillips curve model. The explanatory variables used in the model are the output gap, percentage changes in the import price index, the residential property price index and the total outstanding bank loans. The output gap measures the deviations of actual output from its potential level. The deviations result from cyclical demand and shocks. The output gap is usually measured by means of some filtering methods, like the Hodrick Prescott (HP) filter. In our study, we have used a cubic smoothing spline, which is a generalization of the HP filter, to approximate trend output. The import price variable is meant to capture the pressure on the general price level due to changes in import prices, which have been falling since 1996. Including percentage changes in the property price index and bank loans in the Phillips curve is non-standard in the literature, but can be motivated by the debt-deflation theory of Irving Fisher (1933). Goodhart and Hofmann (2001) show that both the US deflation in the 1930s and the Japanese deflation in the 1990s were preceded by crashes in the stock market and in the property market. The sharp fall in asset prices led to severe financial and economic distress. From 1929 to 1933, the US economy shrank by about 30% and consumer prices dropped by 25%. Japan has been wrestling with deflationary pressure in the past couple of years. As pointed out before, the crash in property prices in Hong Kong also preceded the fall in consumer prices, and bank credits had also shrunk since 1998.

The time-series plots of the variables used in our study are shown in Figure 5 and Figure 6, in level and in rates of change, respectively. Our sample period is from 1984Q1 to 2002Q2. There are considerable fluctuations in the rates of change of the

variables. 1985 and 1998 stand out as particularly difficult years for the economy. Figure 7 presents the sample auto-correlation functions (acf) of the variables. As can be seen, all variables are serially correlated, and the auto-correlation is highest for the inflation rate variable.

To circumvent the endogeneity problem, we adopt a forecasting perspective by including only lagged variables as explanatory variables in the estimated model. We have to choose the appropriate lag length. We start with a general model with 4 lags, and then successively restrict the model to lower order. As shown in Table 2, restricting the model to be first order cannot be rejected by the sample data. The first order model is also supported by the Akaike Information Criterion (AIC). Restricting the model further to be purely first-order auto-regressive results in a F ratio of 16.22 which is highly significant. The null hypothesis that an AR(1) model is adequate can therefore be strongly rejected. Our four explanatory variables are important in accounting for the movements of inflation rates, even after controlling for lagged inflation.

Table 2: Lag Length Selection

Model	Res.Df	RSS	Df	Sum of Sq	F	Pr(>F)	AIC
AR(1)	72	62.9					204.0
1 lag	68	32.1	4	30.8	16.22	0.00	162.3
2 lags	63	29.7	5	2.5	1.04	0.41	166.4
3 lags	58	26.4	5	3.2	1.36	0.25	167.9
4 lags	53	25.2	5	1.3	0.54	0.74	174.1

Given the variables are highly auto-correlated in the sample, it is not surprising to find that the sample data do not contain sufficient information to estimate the lag structure more precisely. The first-order model should not be interpreted literally, as saying that the dynamic of the inflation process is really governed by a first-order stochastic difference equation. In all likelihood, the true dynamical structure is more complicated, but our sample data are not informative enough to estimate the structure with any precision. The estimated model can be treated only as an approximation to the unknown data-generation process.

A standard outlier-test shows that 84Q4 is an aberrant observation. The model cannot handle the abrupt fall in the inflation rate from 10.3% in 84Q1 to 5% in 84Q4. A dummy variable is used to control for this outlier. The estimates of the first-order model with the dummy variable are given in Table 3. All the coefficient estimates have the expected signs. The estimates for the output gap and import price index are not statistically significant at conventional levels, but their t-ratios are greater than 1. Retaining them in the regression will reduce the mean squares error of the fitted model. The estimates for property price and total loans are statistically significant, and the most statistically significant variable is the lagged dependent variable, which also has the biggest coefficient estimate. This reflects the high auto-correlation of

inflation during the sample period. A 1% rise in inflation this quarter will lead to a 0.8% rise in inflation in the next quarter. In contrast, the estimates for the four explanatory variables are not large. For example, a 1% increase in import price this quarter will be associated with only a 0.04% increase in inflation in the next quarter¹.

The model fits the sample data well, with a high R^2 of 0.985. The goodness of fit can be seen in Figure 8 which shows the actual and fitted values of inflation rates over the sample period. The standard error of the shock to the model is estimated to be 0.6%, which is small compared with the sample standard deviation of inflation rate which is 4.7%. Figure 9 shows the residuals of the fitted first-order model. The error variance seems to be constant over the sample period. Figure 10 presents the ACF of the residuals. The auto-correlation coefficients of the residuals are small and insignificant, except at lag 4. The 4th order lagged correlation coefficient for the residuals is -0.34. This pattern is not surprising, given that inflation rate is constructed as a 4-quarter logarithmic difference in the price level. A higher than average inflation last year tends to be associated with a lower than average inflation in the current quarter. Dealing with this high order negative correlation in the residuals by including more lags of the dependent variable is not supported by the sample data, as shown in Table 2.

Table 3: Estimates of the First-Order Model

Dependent Variable: Inflation Rate

	Estimate	Std. Error	t-value
(Intercept)	0.23476	0.11867	1.98
Inflation(-1)	0.82198	0.02823	29.12
Output Gap(-1)	0.02209	0.01690	1.31
Change in Import Price(-1)	0.03784	0.02136	1.77
Change in Property Price(-1)	0.01705	0.00523	3.26
Change in Total Loans(-1)	0.03947	0.01011	3.90
84Q4 Dummy	-2.92110	0.64505	-4.53

Residual standard error: 0.606 on 67 degrees of freedom
Multiple R-Squared: 0.985, Adjusted R-squared: 0.984
F-statistic: 731 on 6 and 67 DF, p-value: <2e-16

5.1 Testing for Structural Change in the Model

We want to test whether there is any structural change in the data generation process for the inflation rate, as approximated by our first-order model. One approach is to

¹ Using annual data, Ha and Leung (2001) find that output gap and import price have large and statistical significant effects on inflation.

use fluctuation tests first introduced by Brown et al (1975). The basic idea is that if there is a structural change, the residuals using all the data should be substantially different from the residuals of the data that do not contain the structural breaks. With no structural breaks, the cumulative sums of the recursive residuals should fluctuate around zero, and their moving sums should not have any evident trend. Figure 11 and Figure 12 show the time paths of the cumulative sums and moving sums of the recursive residuals of the first-order model, respectively. As can be seen, the two empirical fluctuation processes do not show any evidence of structural break during the sample period. More formally, the cusum test yields a test statistic of 0.38, which has a marginal significance level of 0.89. The test statistic of the moving sums test is 0.84 with a marginal significance level of 0.43. Hence, both tests for structural change are insignificant.

Another more stringent test for structural break is to conduct out-of-sample forecasting. The first-order model is re-estimated by using data up to 1997Q4. The fitted model is then used to project the path of inflation rates after 1997, using the actual realized values of the lagged variables used in the regression. As can be seen in Figure 13, the model performs well under this out-of-sample forecasting test. The fitted first-order model using data only up to 1997 can track the inflation rates after the estimation end-point. Most importantly, the fitted model is able to predict deflation in the past couple of years.

5.2 Projecting the Future with the Estimated Model

As we have uncovered no evidence for structural break for our fitted first-order model, we can use it to project the course of deflation in the future. We have to predict the future time paths of the explanatory variables first. Three sets of scenarios are considered:

- (1) **Auto-regressive expectations:** This implies that the future is driven by the recent behavior of the key variables. In the context of the model we have estimated, future deflation rates will be highly influenced by current deflation rates. As a consequence, deflation is likely to persist for a longer time as the population is trapped in deflationary expectations.
- (2) **Mean reverting expectations:** This implies that the future is driven by the belief that since deflation is ultimately a self-limiting process therefore the public expectations should converge very rapidly to it. This occurs by setting the forecasts of the key variables to their mean values, which are the values that they would converge on. Deflationary expectations will therefore be quickly eliminated and actual deflation would end rapidly.
- (3) **Stabilizing expectations:** This describes a situation in between auto-regressive expectations and mean reverting expectations. In this situation the forecasts of the key variables that determine deflation are neither those of the recent past nor of the distant future (i.e., the converged mean values), but unchanging stable ones where all the rates of change are zero.

One natural starting point is to assume auto-regressive expectations. In essence, we use the Vector Auto-Regressive (VAR) model to form forecasts of the explanatory variables. The VAR forecasts are shown in Figure 14. As expected, the forecasts for the output gap fluctuate around zero, and converge to its equilibrium zero value in two to three years time. Import price is forecasted to rise slowly. There are steady improvements in the growth of property price as well as bank loans, but at rather slow rates. Deflation, however, persists for quite some time into the future.

The VAR forecasts are just extrapolations of the recent behavior of the variables. Over a longer horizon, the forecasts will converge to the mean values of the variables. We can consider a scenario with more rapid convergence, and label it as mean reverting. Under this scenario, the explanatory variables are assumed to take on their mean values starting from 2002Q4, namely, the output gap at 0, import price at 1.9%, property price at 5.5% and loan growth at 11%. In between the auto-regressive and mean-reverting scenarios, we can consider a stabilizing scenario under which the explanatory variables are all set to zero.

Figure 15 shows the forecasts of inflation under the three different scenarios. With auto-regressive expectations, deflation will worsen to 4.5% by the middle of 2003 and then steadily improve, but very slowly. Deflation will, however, linger around for quite sometime. Under a stabilizing environment, the situation is much better. Deflation will be less than 1% in 2004. With mean-reverting expectations, we will have inflation starting from the second half of 2003.

5.3 What are the policy options?

The three scenarios illustrate the importance of expectations in driving the future course of the general price level. Given the strong auto-correlation, deflation will take two to three years to moderate even under a stabilizing environment. With auto-regressive expectations projecting the recent past into the future, deflation is likely to continue for quite sometime. However, with sufficiently strong positive shocks to shift expectations upward, deflation can be turned around within a year or two.

Shifting expectations is crucial, but it is not easy to achieve. Policy options are limited. Fiscal measures can be used to shock up the output gap, but this will not be very effective because of the large leakages in an open economy. The huge budget deficits also limit the scope of reflating the economy through the government budget. Despite the steps taken to overhaul land and housing policies, the property market is still struggling. The growth in bank loans is governed by the credit policies of the commercial banks, and has been hampered by the sharp fall in property prices. Import prices are determined in the world market.

A steep devaluation of the Hong Kong dollar can certainly boost local prices of imported goods, and end the deflation process. But this is frightfully difficult to execute well and the “cure” may well be much worse than the “disease”. Deflation is the manifestation of the adjustment process after the bursting of the asset bubbles triggered by the Asian Financial Crisis. Anchored by our linked exchange rate system, domestic prices have to bear the full burden of the adjustment. Since then the world economy had been hit by a sequence of negative shocks: stalling of the US growth

engine, bursting of the tech bubble, collapse of stock prices, the 911 terrorist attacks, accounting scandals and the concomitant slowdown in the world economy. All these negative shocks have made the adjustment process in Hong Kong much more difficult to cope with. Other economies in the region have also to wrestle with the same deflationary pressure.

Unlike inflation, deflation is a self-limiting process. Prices cannot fall forever. Sooner or later, the price level will be stabilized. It takes time for the private sector to rebuild its balance sheets. The adjustment process, though painful, also serves to make the economy as a whole more competitive, as can be seen by the robust performance in the sectors connected with external trade. The current accounts have been in surplus in recent years, and Hong Kong is a net creditor to the outside world. At year-end of 2001, Hong Kong's net external assets are among the largest in the world, amounting to US\$286 billion, which is 177% of GDP. As a whole society, Hong Kong is still rich. Also, unlike banks in Japan, our banking system is still in good shape. The banks are awash with liquidity. With a more positive economic outlook, the banks can create ample credits to finance economic growth, and deflation will be corrected in due course.

Given the enormous importance of the propertied equity in Hong Kong and the considerable size of the public housing sector, the government is best advised to focus on adopting drastic and bold steps to reform the public housing sector as a means to rekindle the public's faith in the private property market as a means to shift deflationary expectations. It is vital that should such measures be adopted then they should be clearly signaled to public so that they can be convinced, or otherwise expectations will not be effectively changed.

6 Concluding Remarks

The current deflation in Hong Kong is cyclical in nature, and will be corrected in due course when the economy picks up. The deflation rate did moderate in 2000 when the economy rebounded from the recession started in late 1998. Given that deflationary expectations are now firmly entrenched, according to our estimates, it will take quite some time for consumer prices to stabilize, without any strong and sustained positive shocks.

We have found no evidence for structural break in our estimated deflation equation, suggesting that structural factors at best have played a minor role in the deflation process. Our finding is consistent with the studies by the IMF and the HKMA.

The price convergence process, which has been going on for more than 20 years, will continue. Given the slow convergence rate, this process will only exert a minor dampening effect on the average price level in Hong Kong. However, some sectors might be affected more adversely. Many restaurants catering to the mass market have closed down, and prices of some consumer services have dropped sharply. These facts are consistent with both the "structuralist" and the "cyclicalist" view of the deflation in Hong Kong. The differential impacts of the price convergence process needs further study.

Policy options available to the government to curtail deflation at this point in time are few and should focus on shifting expectations. The property market may be one promising area. On the other hand managing expectations properly to ensure that the public recognize properly that deflation will end as the global economy recovers is also vital to avoid misplaced pessimism.

Acknowledgments

We are grateful to the HKMA and the Census and Statistics Department to grant us access to some of the data used in this study. Participation at the Deflation Workshop organized by the HKMA stimulated our thinking on some of the issues. Discussion with Wing Suen and C.Y. Tse have been particularly useful. We would also like to thank Eva Chan and June Sieh for their superb research assistance.

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Figure 1: Consumption to GDP Ratio (1990 Prices)

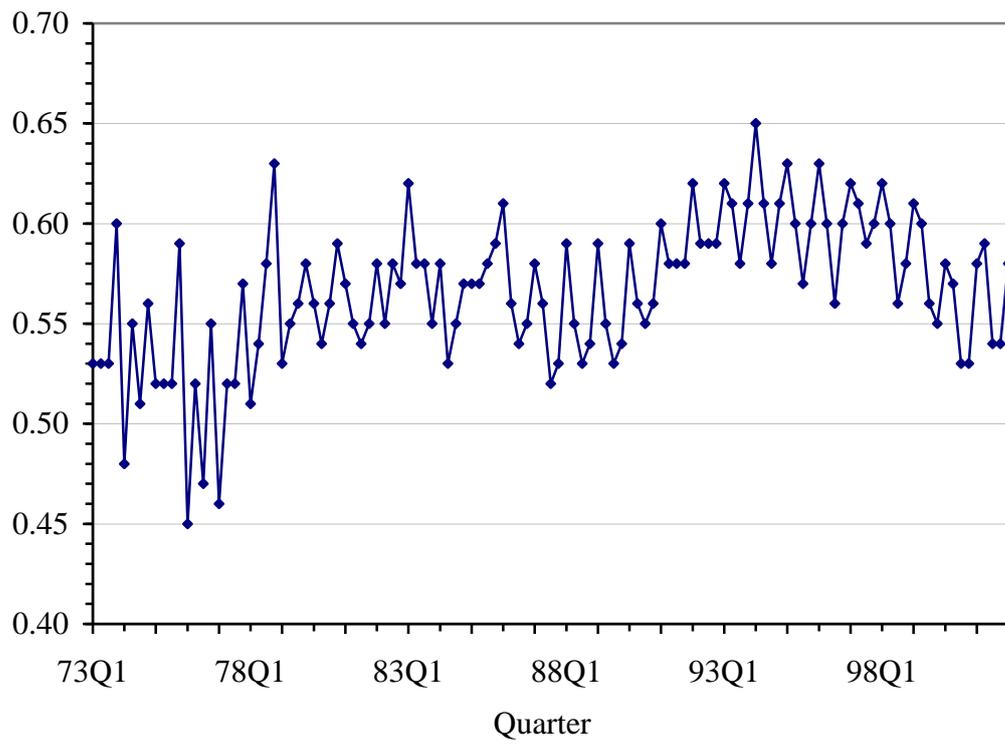


Figure 2: Percentiles of Monthly Earnings for Male Full-Time Workers

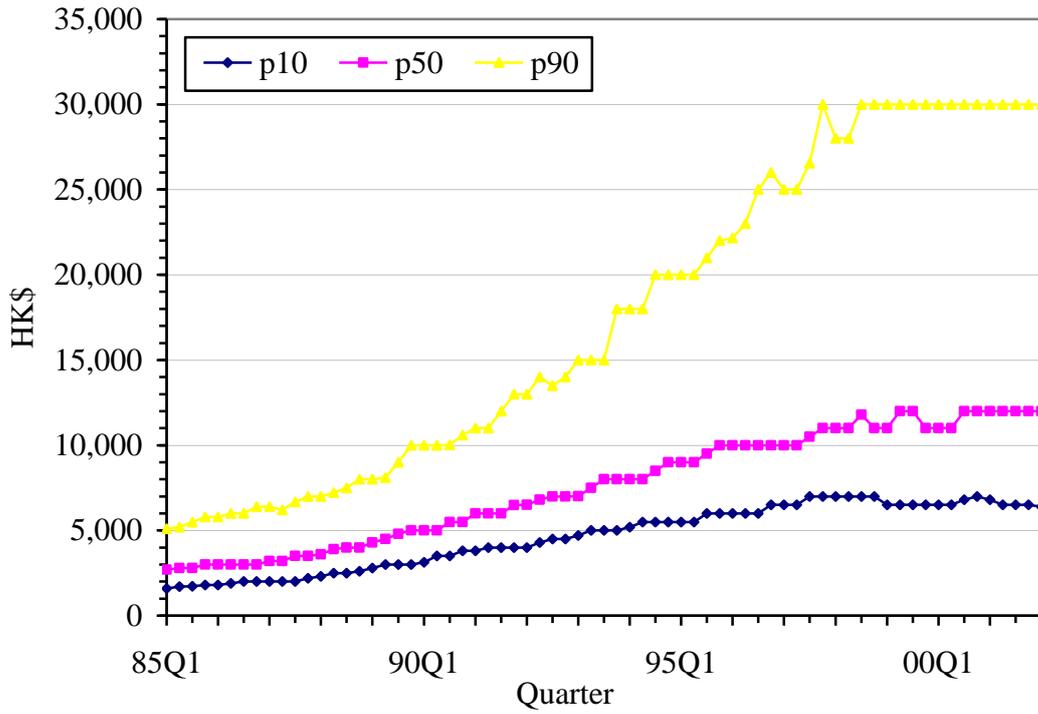


Figure 3: Percentiles of Monthly Earnings for Female Full-Time Workers

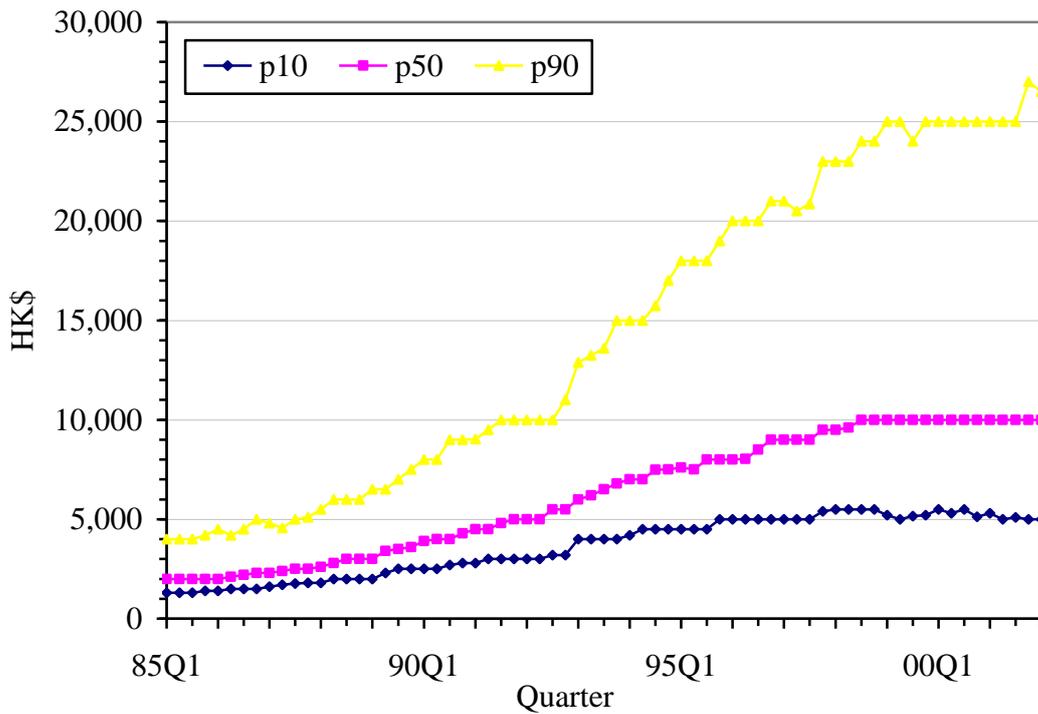


Figure 4: Unemployment Rates by Age Groups

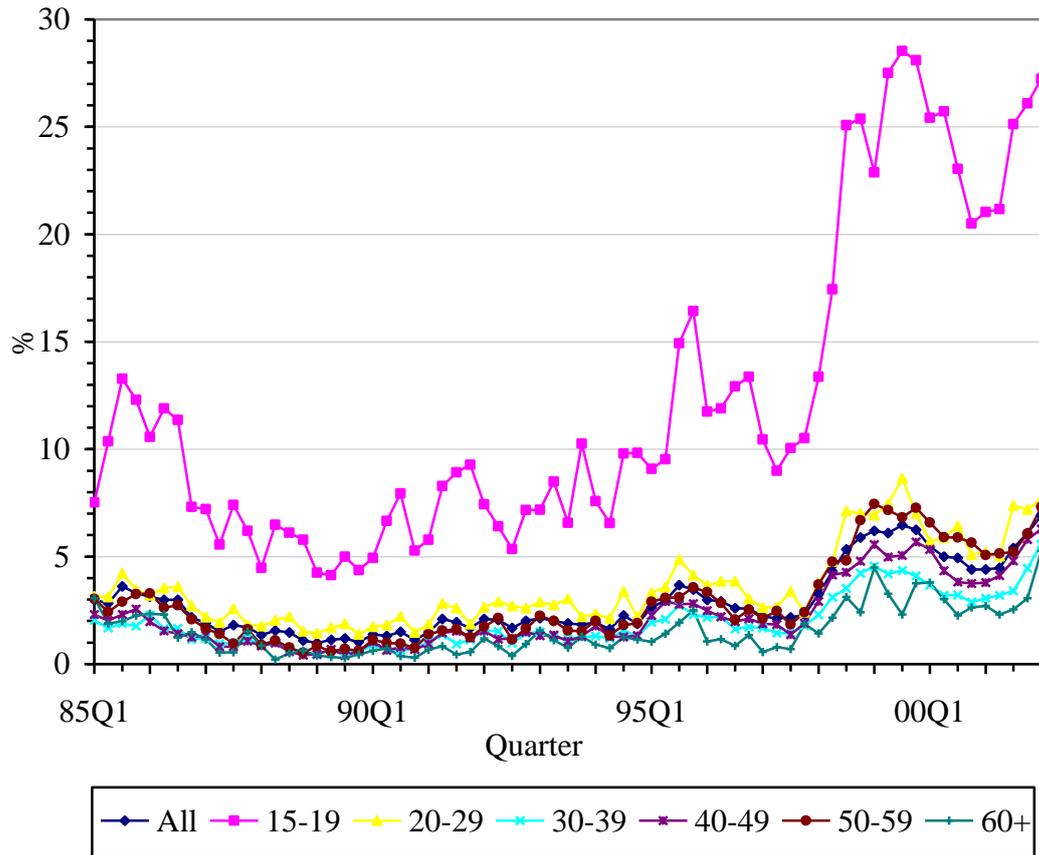


Figure 5: Time-Series Plots of Variables in Level

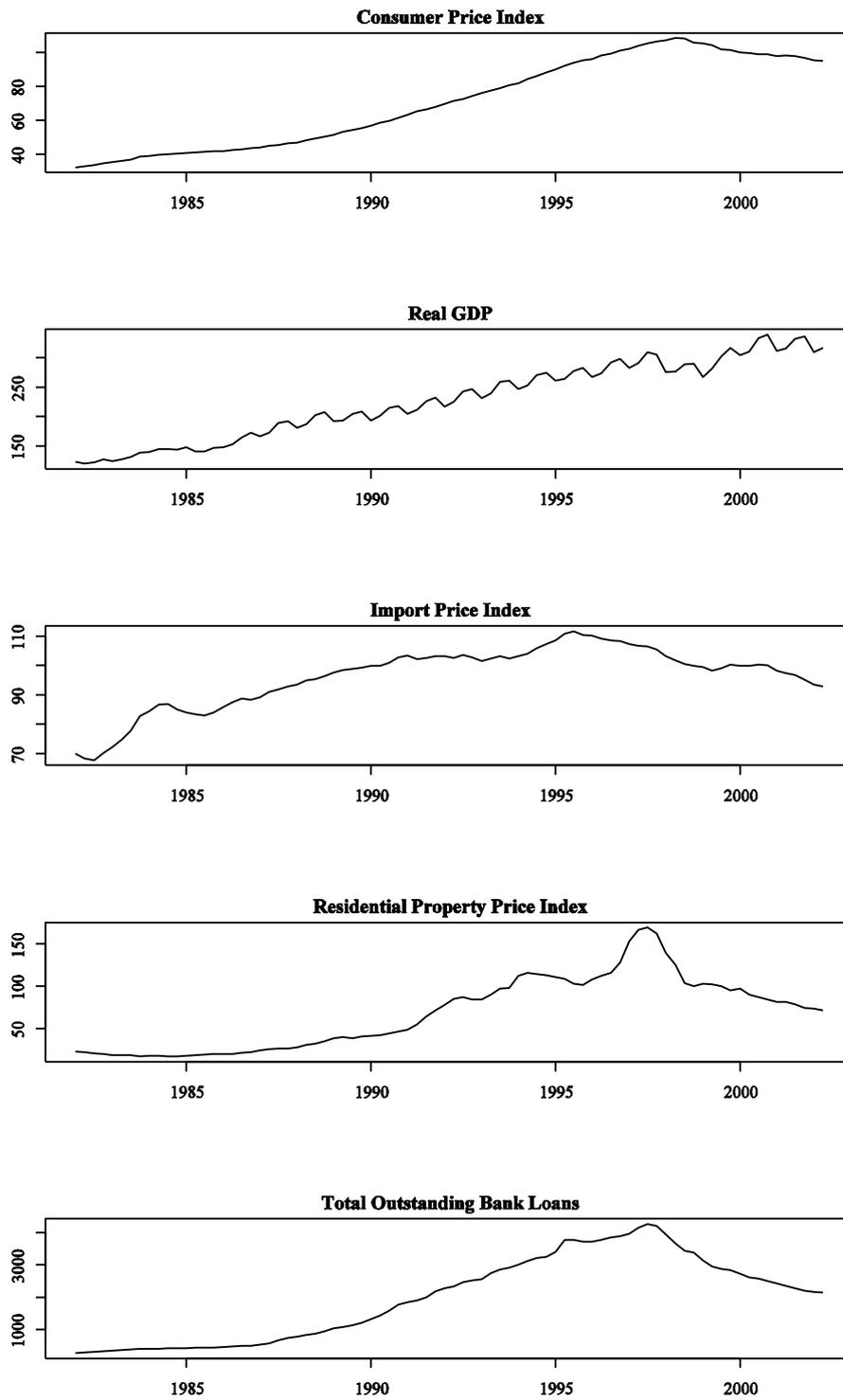


Figure 6: Time-Series Plots of Variables in Rates of Change

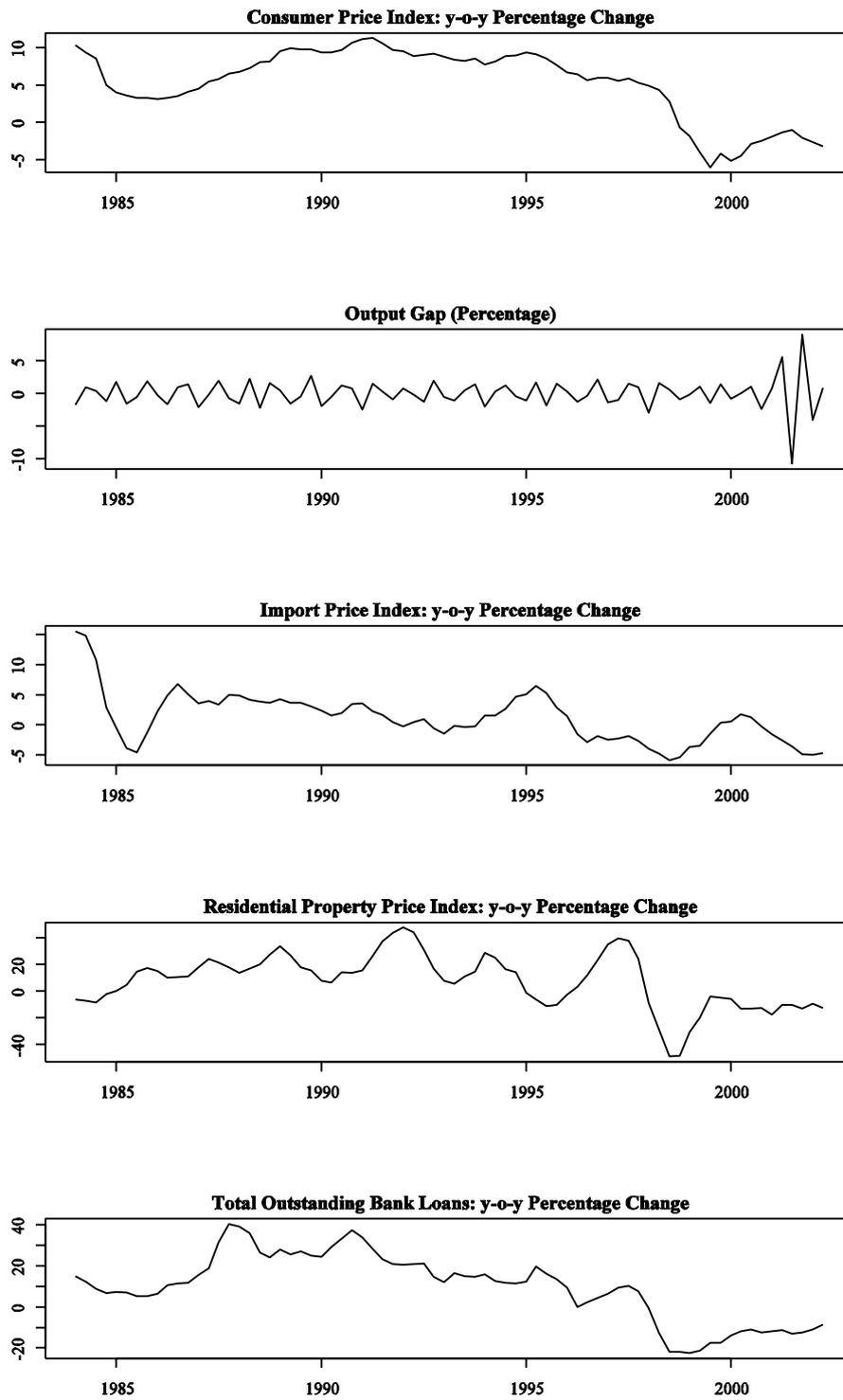


Figure 7: Auto-Correlation Functions of Variables

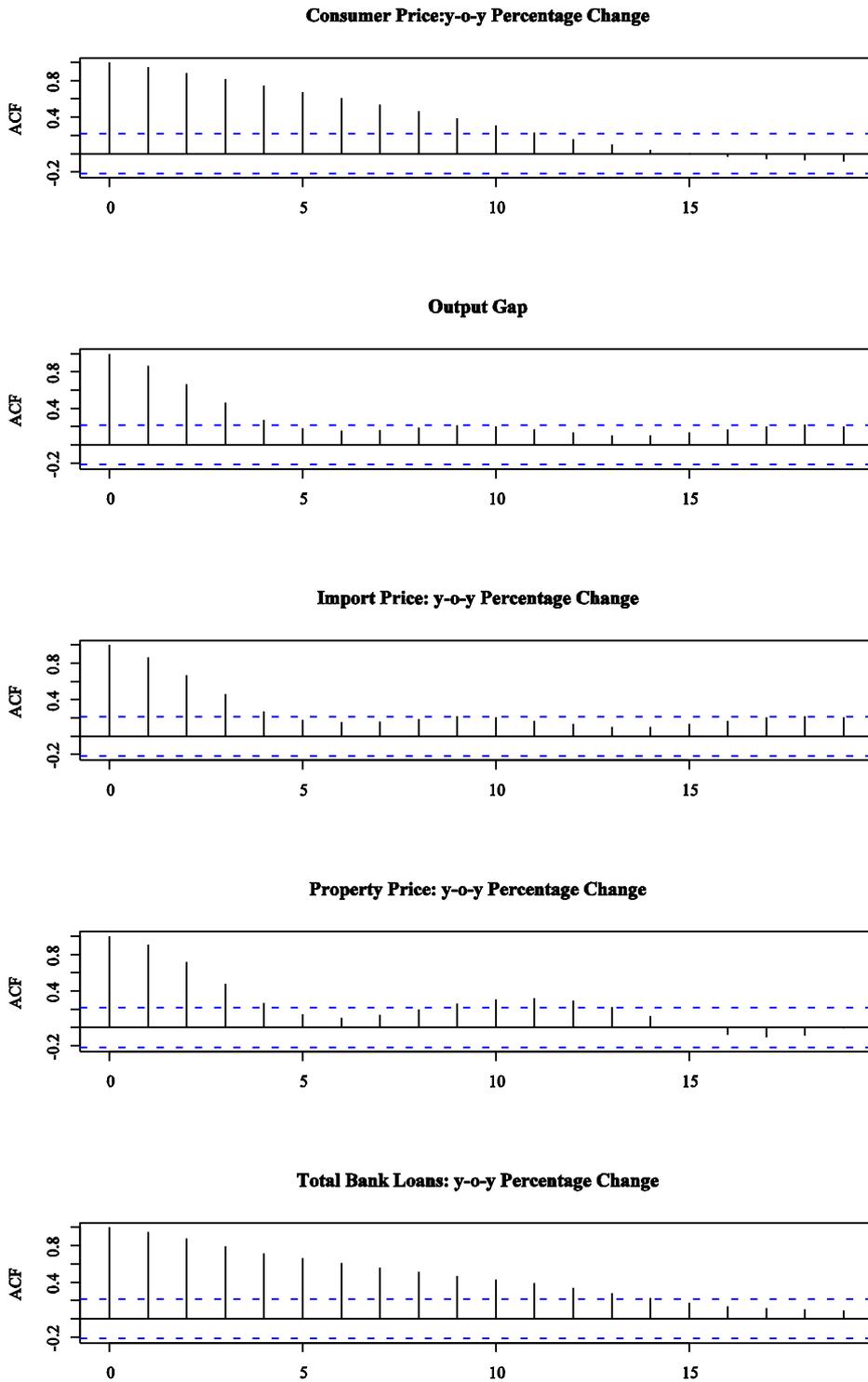


Figure 8: Actual vs Fitted Values of the First-Order Model

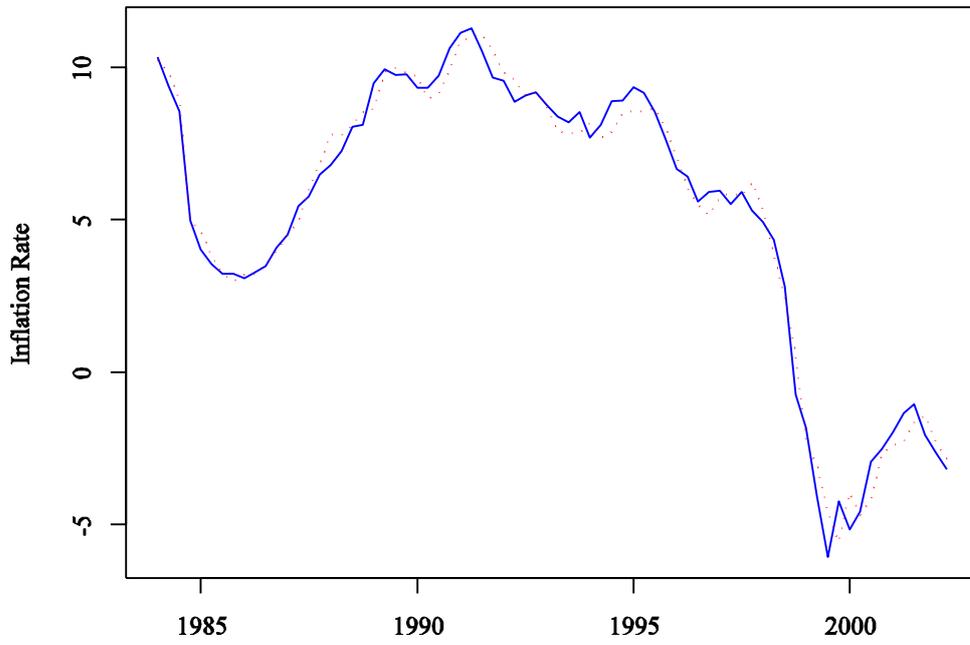


Figure 9: Residuals of the First-Order Model

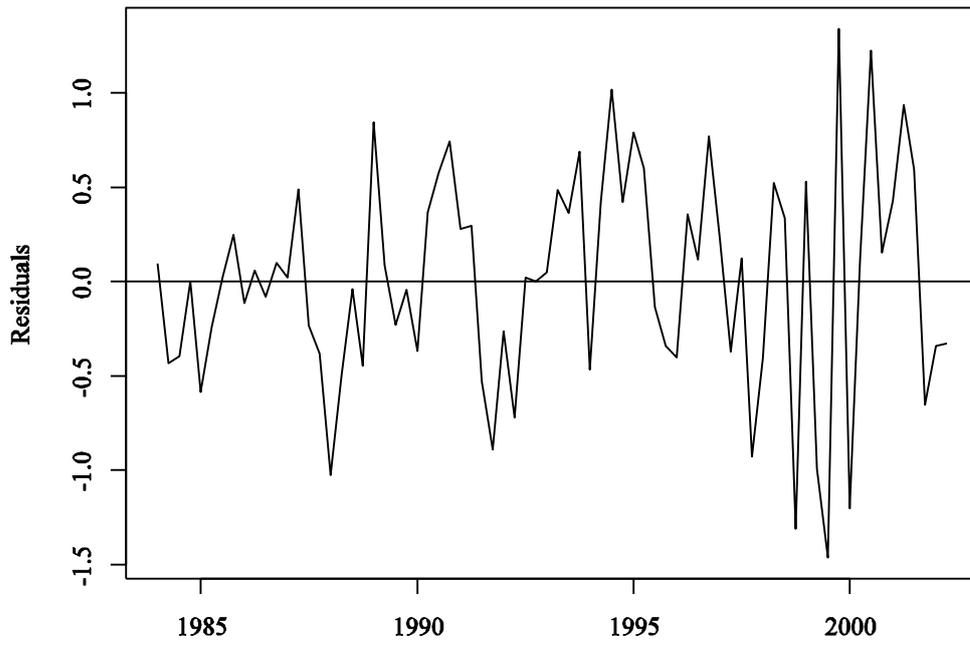


Figure 10: ACF of the Residuals of the First-Order Model

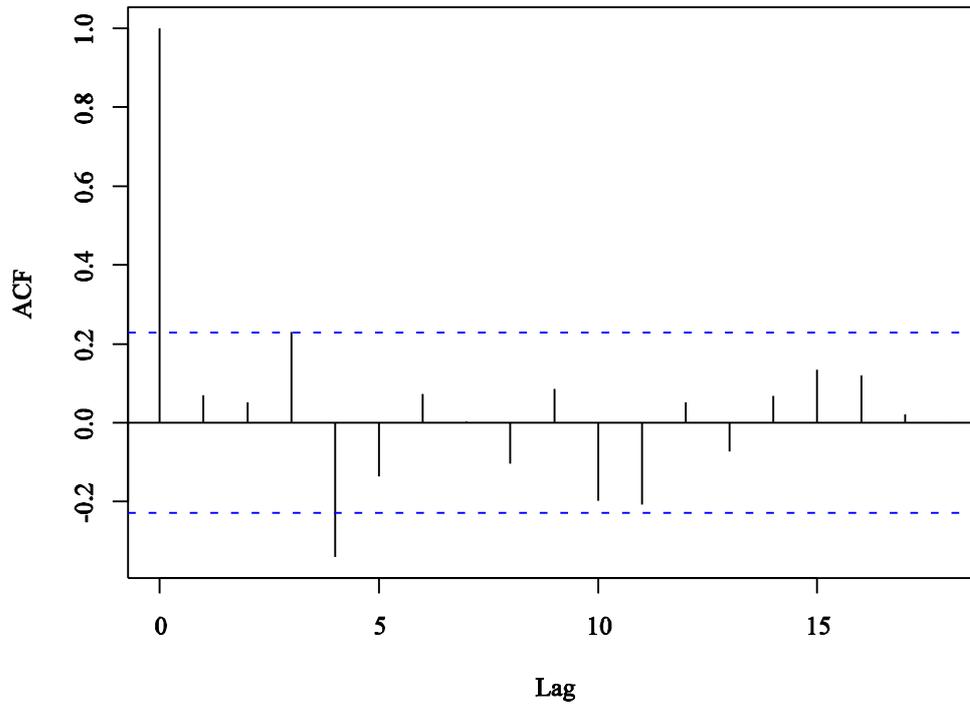


Figure 11: Cumulative Sums Test of Recursive Residuals

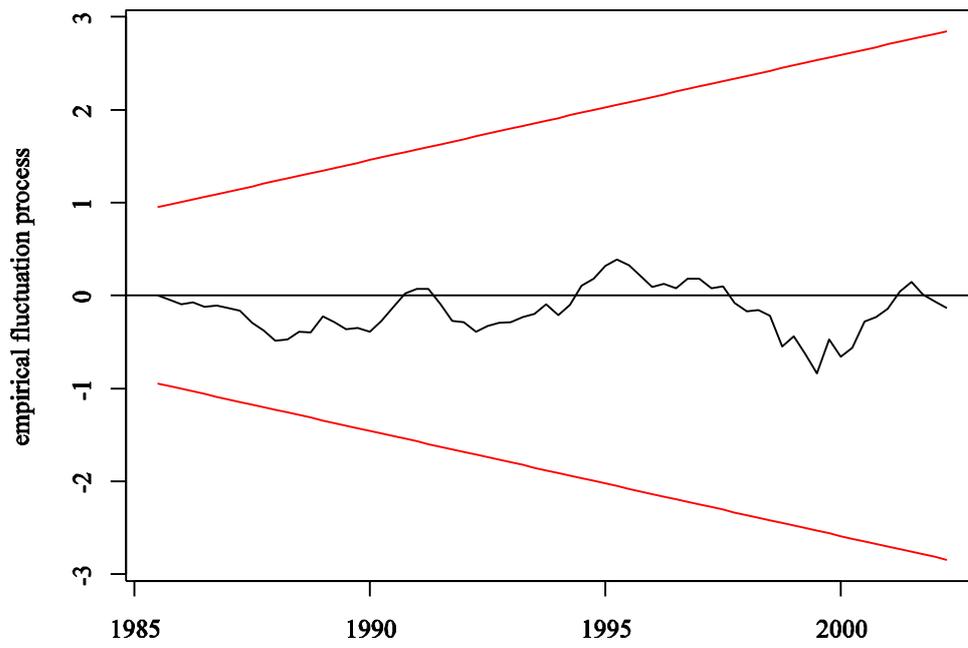


Figure 12: Moving Sums Test of Recursive Residuals

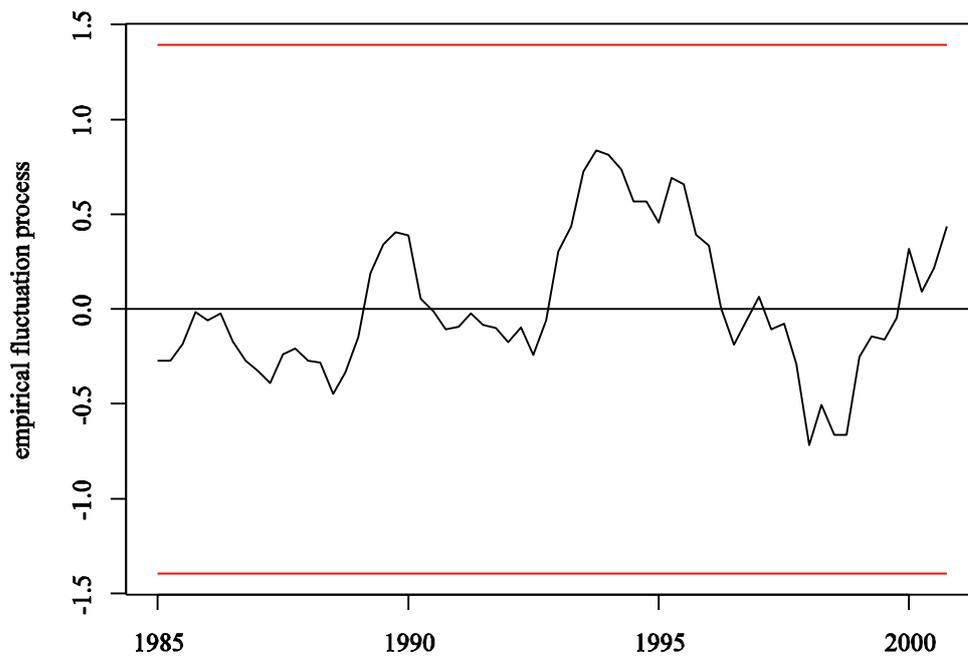


Figure 13: Out-of-Sample Forecasts: 1998Q1 to 2002Q2



Figure 14: VAR Forecasts of Forcing Variables

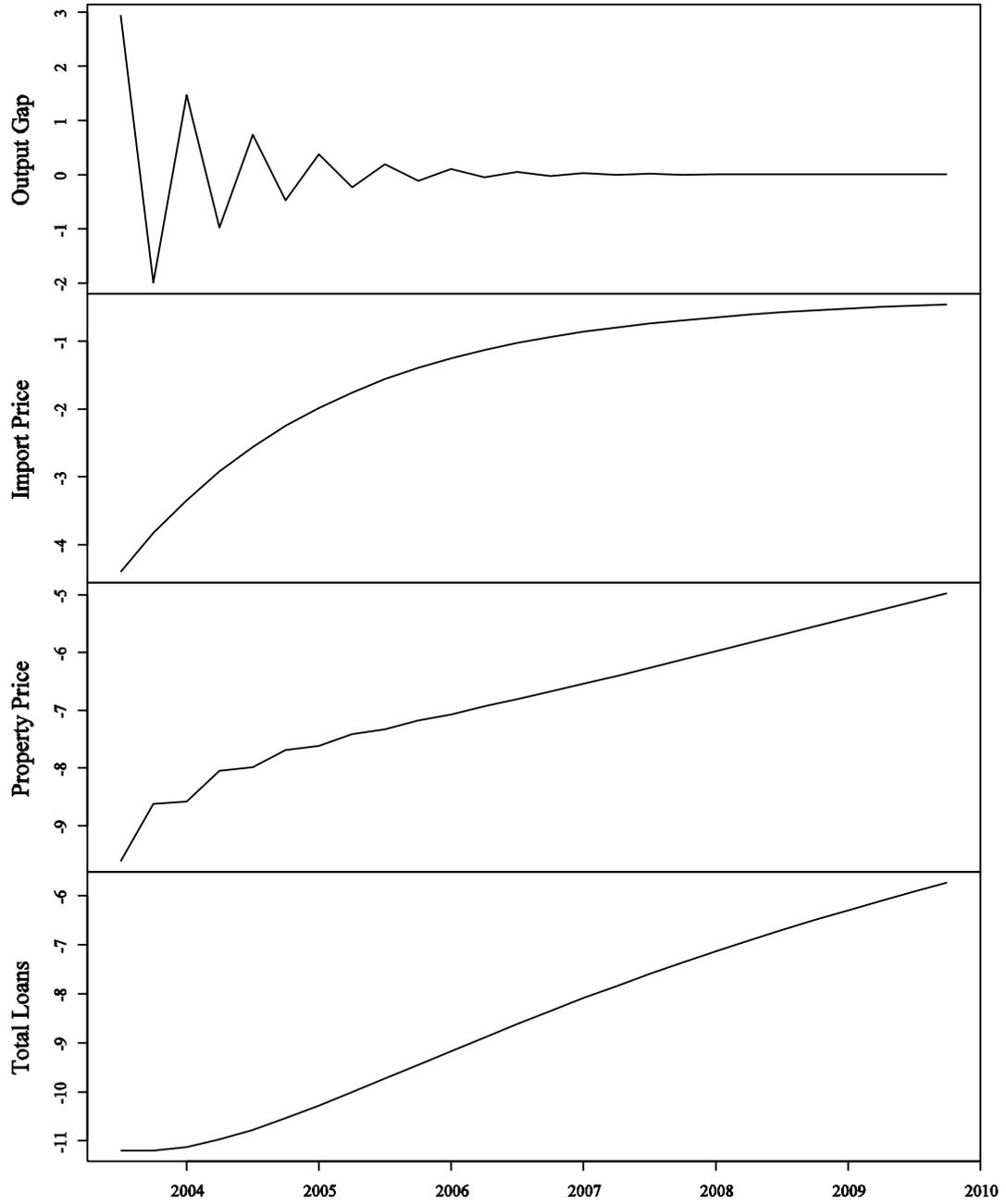


Figure 15: Forecasts of Inflation Rates: 3 Scenarios

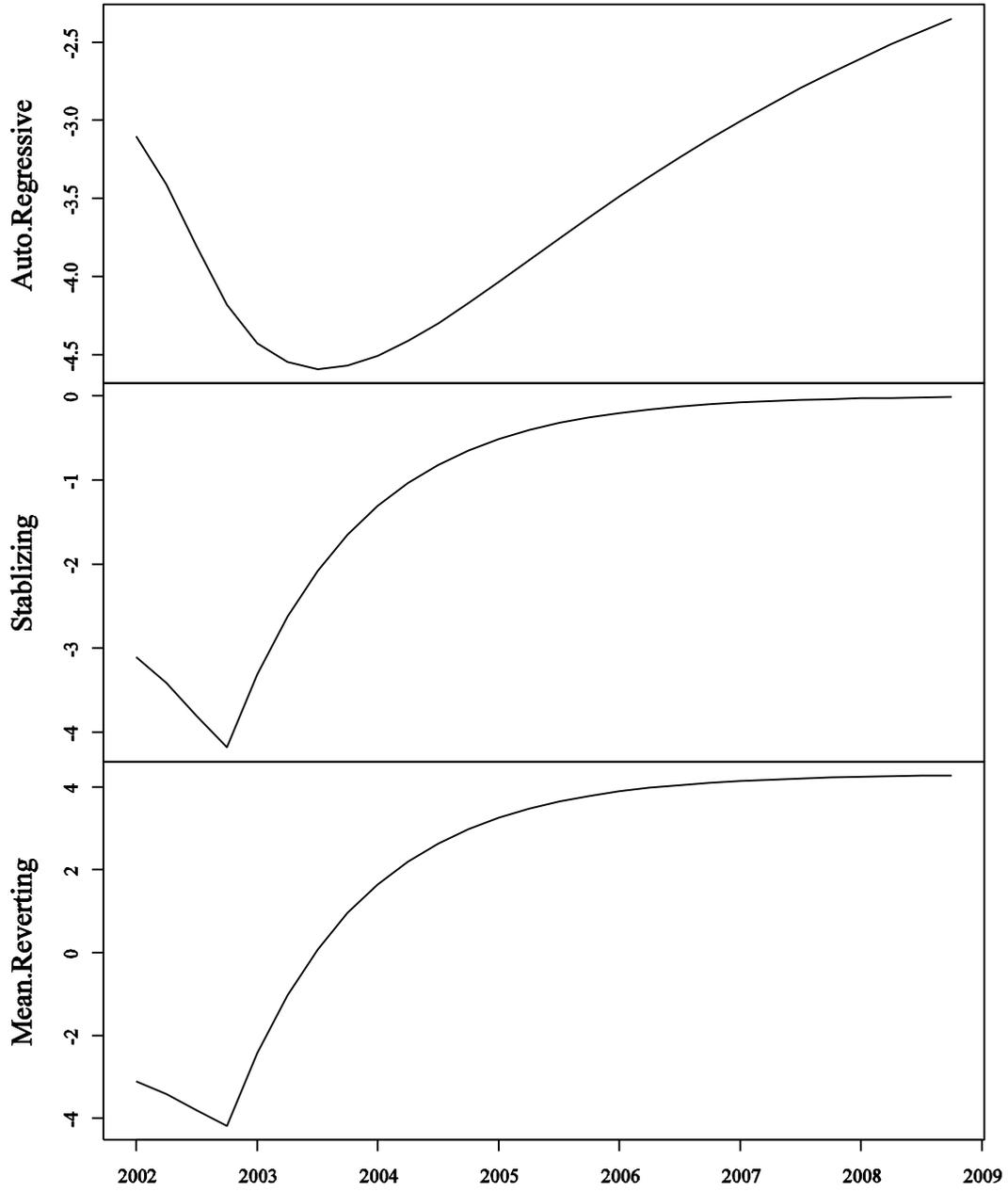


Table 4: Forecasts of Inflation Rates: 3 Scenarios

	Auto Regressive	Stabilizing	Mean Reverting
2002 Q1	-3.10	-3.10	-3.10
2002 Q2	-3.41	-3.41	-3.41
2002 Q3	-3.81	-3.81	-3.81
2002 Q4	-4.18	-4.18	-4.18
2003 Q1	-4.43	-3.31	-2.42
2003 Q2	-4.55	-2.63	-1.03
2003 Q3	-4.59	-2.08	0.08
2003 Q4	-4.57	-1.65	0.95
2004 Q1	-4.51	-1.31	1.65
2004 Q2	-4.41	-1.04	2.20
2004 Q3	-4.30	-0.82	2.63
2004 Q4	-4.17	-0.65	2.98
2005 Q1	-4.03	-0.52	3.26
2005 Q2	-3.90	-0.41	3.47
2005 Q3	-3.76	-0.33	3.65
2005 Q4	-3.62	-0.26	3.78
2006 Q1	-3.49	-0.20	3.89
2006 Q2	-3.36	-0.16	3.98
2006 Q3	-3.24	-0.13	4.05
2006 Q4	-3.12	-0.10	4.10
2007 Q1	-3.00	-0.08	4.14
2007 Q2	-2.90	-0.06	4.18
2007 Q3	-2.79	-0.05	4.20
2007 Q4	-2.70	-0.04	4.22
2008 Q1	-2.60	-0.03	4.24
2008 Q2	-2.51	-0.03	4.25
2008 Q3	-2.43	-0.02	4.27
2008 Q4	-2.35	-0.02	4.27

Appendix

A Diagrammatic Exposition of the Interpretative Framework

In the decade from the mid-1980s to the mid-1990s manufacturing operations were moved across the border and greatly expanded their scale of operation. Two effects took place in Hong Kong.

First, the manufacturing sector in Hong Kong experienced a huge increase in productivity relative to the service sector. We assume that manufactured goods are predominantly tradable goods and services are primarily non-tradable. Hence the Hong Kong economy is best described as having experienced faster productivity growth in tradable goods relative to non-tradable services.

Productivity growth in tradable goods and non-tradable services will result in downward shifts of their respective supply schedules. Diagrams 1a and 1b show that the downward shift of the supply schedule of tradable goods from S to S' is more than that of non-tradable services. Prices of non-tradable services (P_N) therefore will rise relative to tradable goods (P_T). The price of tradable goods is fixed in the world market; hence, the supply schedule of tradable goods of the rest of world is horizontal S^{ROW} . Under the linked exchange rate (e), prices of tradable goods have to rise or fall in tandem with world prices. For given P_T then P_N must rise and this is reflected in the downward shift of S^{ROW} to \underline{S}^{ROW} in Diagram 1a.

The domestic price level in Hong Kong, which is a combination of tradable goods and non-tradable services, will rise faster than world prices. This is the cause and nature of structural inflation in Hong Kong. Structural inflation results from rising demand for non-tradable services that have to be domestically produced.

Second, returns from assets invested across the border in China resulted in a substantial rise in the incomes of Hong Kong residents above their domestically produced incomes. The increase in income is reflected in the upward shift in the demand schedules for tradable goods and non-tradable services from D to D' in Diagrams 2a and 2b. Any increase in demand for tradable goods could be met initially through imports and will not bid up P_T . However, the price of non-tradable services will have to be met through an increase in domestic supply and P_N will rise. As a consequence, P_N will rise relative to P_T further fuelling structural inflation. Consumption spending in Hong Kong would therefore rise faster than GDP during inflationary periods.

By the mid-1990s the expansion of manufacturing activities across the border was slowing, consequently structural inflationary pressure was eased. With the onset of the Asian Financial Crisis in 1997 and the subsequent global economic slowdown in 2001, the returns from assets invested externally also fell. Falling interest rates that took place later, and especially when the global economic slowdown emerged, is a good indicator of the declining returns from external incomes. The adjustments shown in Diagrams 2a and 2b are therefore reversed and we began to observe deflation pressure as the demand for non-tradable service begin to decline.

It is important to note that the deflationary pressure caused by the decline in income from net external assets is not a simple case of structural deflation. The decline in income from net external assets is cyclical in nature and stems from the regional and global recession that started in 1997. The effect of this recession on Hong Kong is amplified by virtue of the very large net external assets of Hong Kong. This “structural” feature of the Hong Kong economy means that the effects of regional and global business cycles exacerbate the volatility of the economy.

The framework can also be used to understand the implications of the “Gortex border” between Hong Kong and the Mainland on structural inflation.

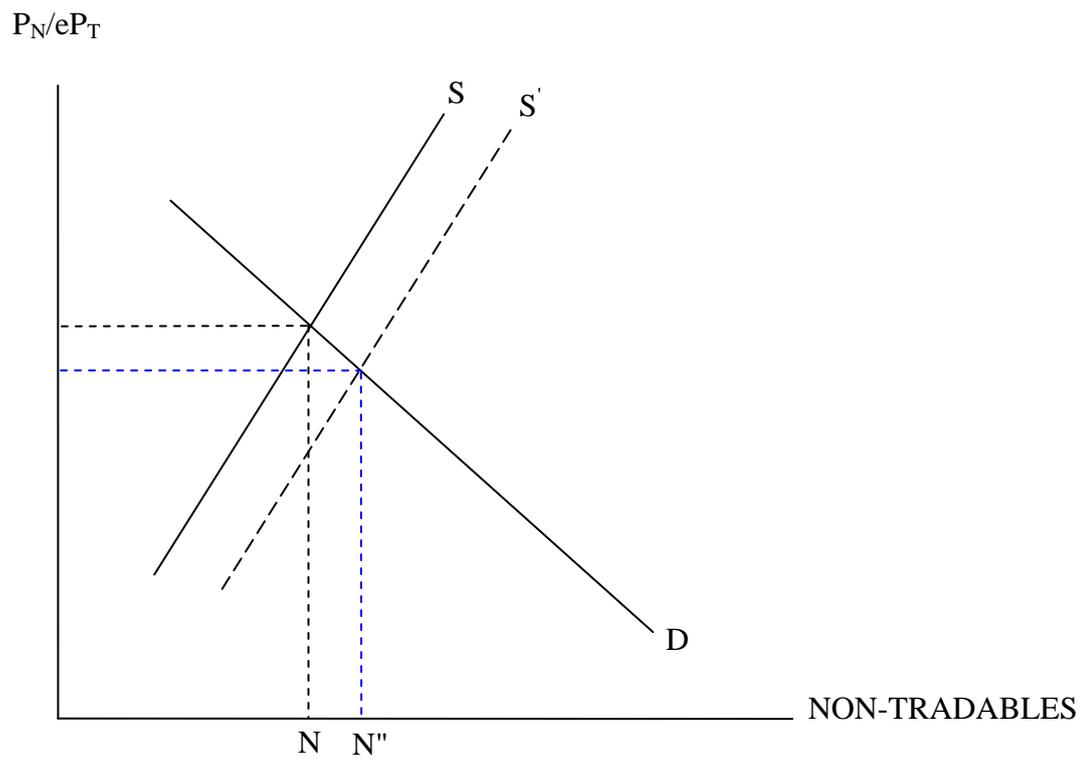
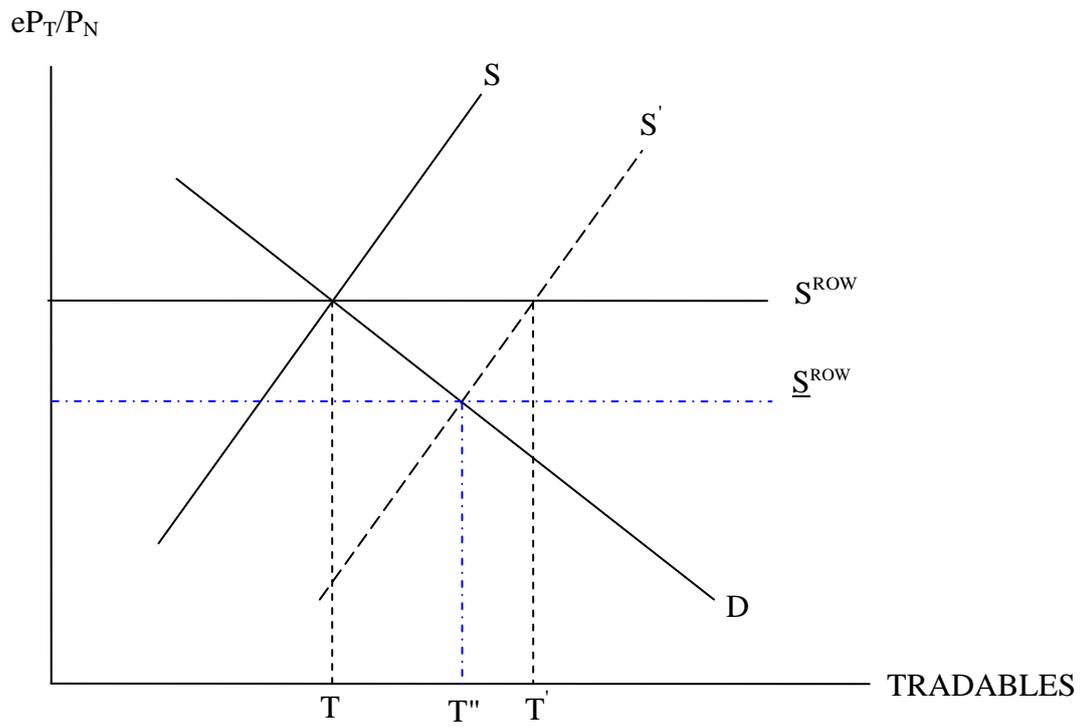
The growing phenomenon of Hong Kong residents crossing the border to purchase a variety of consumption goods and services that were previously consumed domestically as non-tradable goods has two effects. First, the ease of crossing the border from Hong Kong into the Mainland had transformed some non-tradable services into tradable ones through a neighborhood effect. This phenomenon can be shown in Diagram 3b as the emergence of an infinite supply of non-tradable services S^{NEIGHBOR} at a price that is below the original market-clearing price. The amount supplied of non-tradable services in Hong Kong therefore declines to T_P and the amount that is consumed across the border becomes $(T_C - T_P)$. This neighborhood effect reduces the demand for non-tradable services in Hong Kong and results in a further decline in their prices thereby contributing to deflationary pressures.

Second, as P_N falls then the price of tradable goods relative to non-tradable services rises from S^{ROW} to $\underline{S}^{\text{ROW}}$ as shown in Diagram 3a. Structural deflation as depicted through this process will cease when it is no longer economically worthwhile to engage in cross border consumption of this kind. This happens partly because prices across the border will rise over time. The process will also slow down with productivity gains in non-tradable services in Hong Kong that will lower their prices.

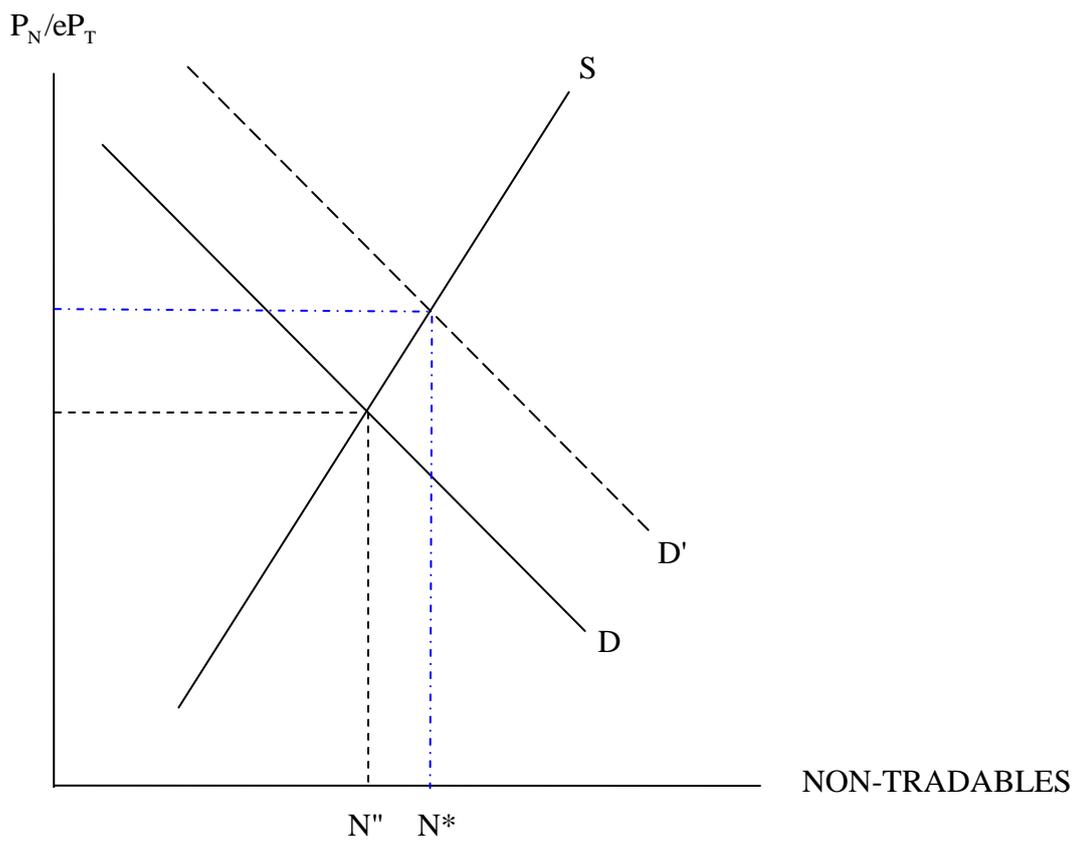
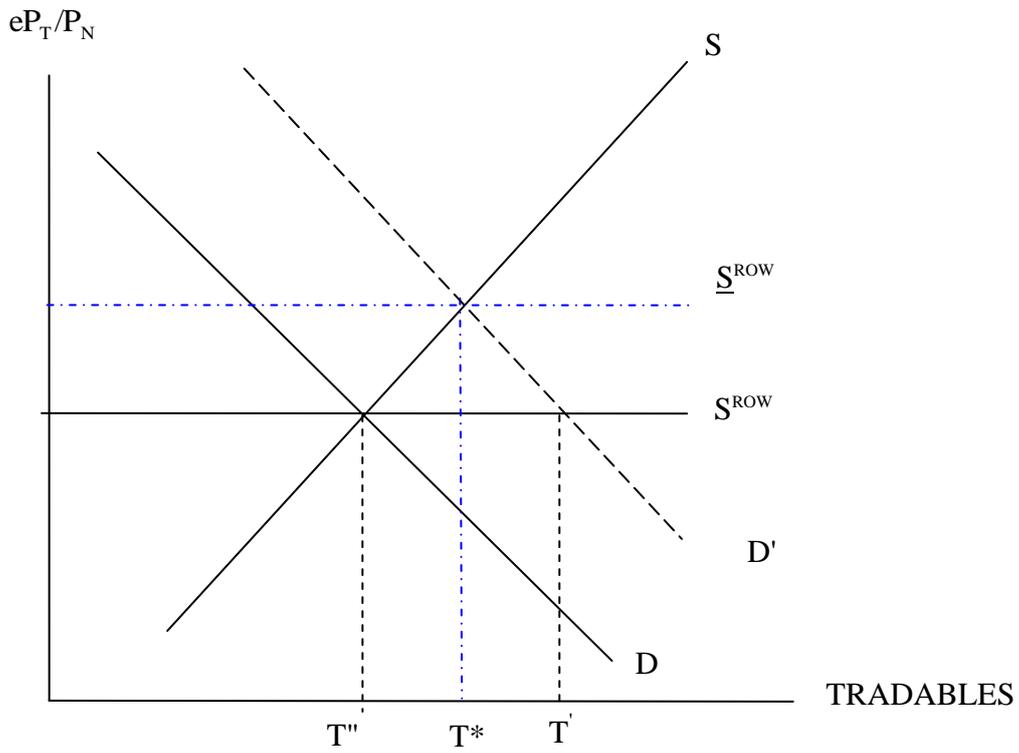
It is worth noting that the movement of production operations (both manufacturing and services) into China creates structural inflationary pressures that are opposite to the neighborhood effect of crossing the border for consumption purchases. Economic integration and the resulting structural change create both deflationary and inflationary pressures. It is likely that prior to the mid-1990s inflationary pressures dominate, but in the current environment deflationary pressures dominate.

Increasing the flow of Mainland visitors into Hong Kong for tourism, work or residence would increase the demand for non-tradable services in Hong Kong and is shown in Diagram 4b as an upward shift in the demand schedule from D to D^* . If the total amount of tradable services consumed across the border remains unchanged at $(N_{C^*} - N_{P^*})$ then the production of non-tradable services in Hong Kong will increase from N_P to N_{P^*} . Structural inflation would appear as P_N rises to P^* . If the inflow of visitors is sufficiently large then it could well dominate the deflationary pressures arising from cross border consumption activities. As P_N rises then the price of tradable goods relative to non-tradable services falls from S^{ROW} to $\underline{S}^{\text{ROW}}$ as shown in Diagram 4a.

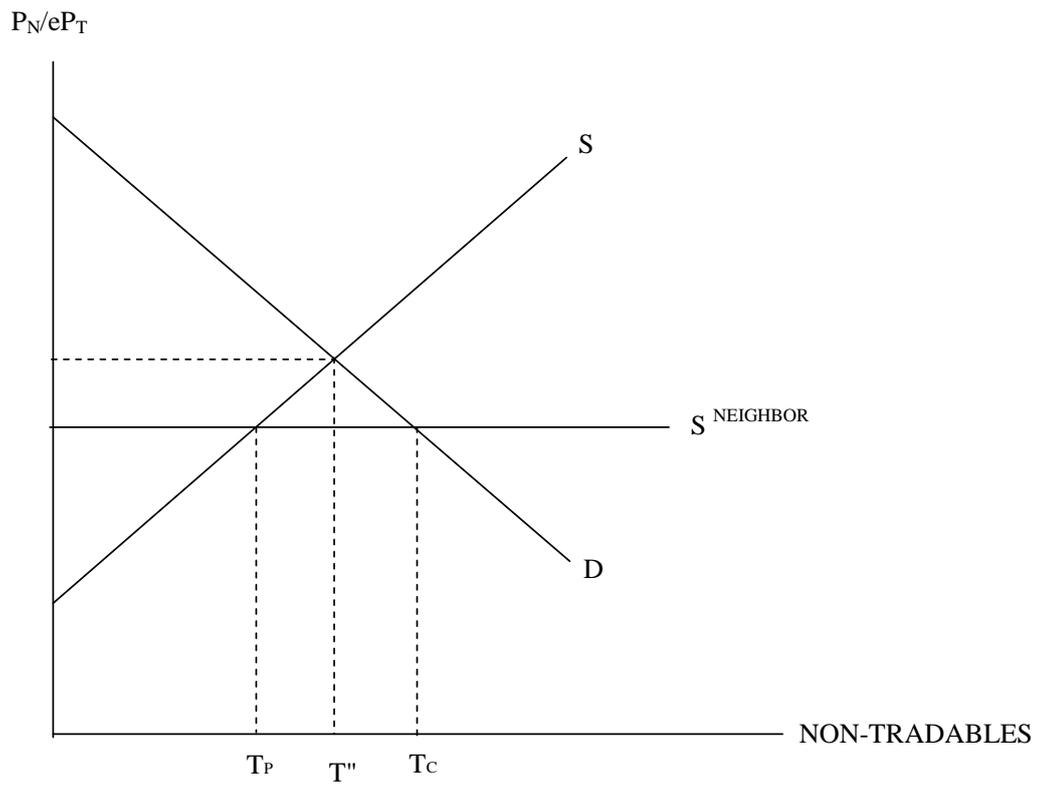
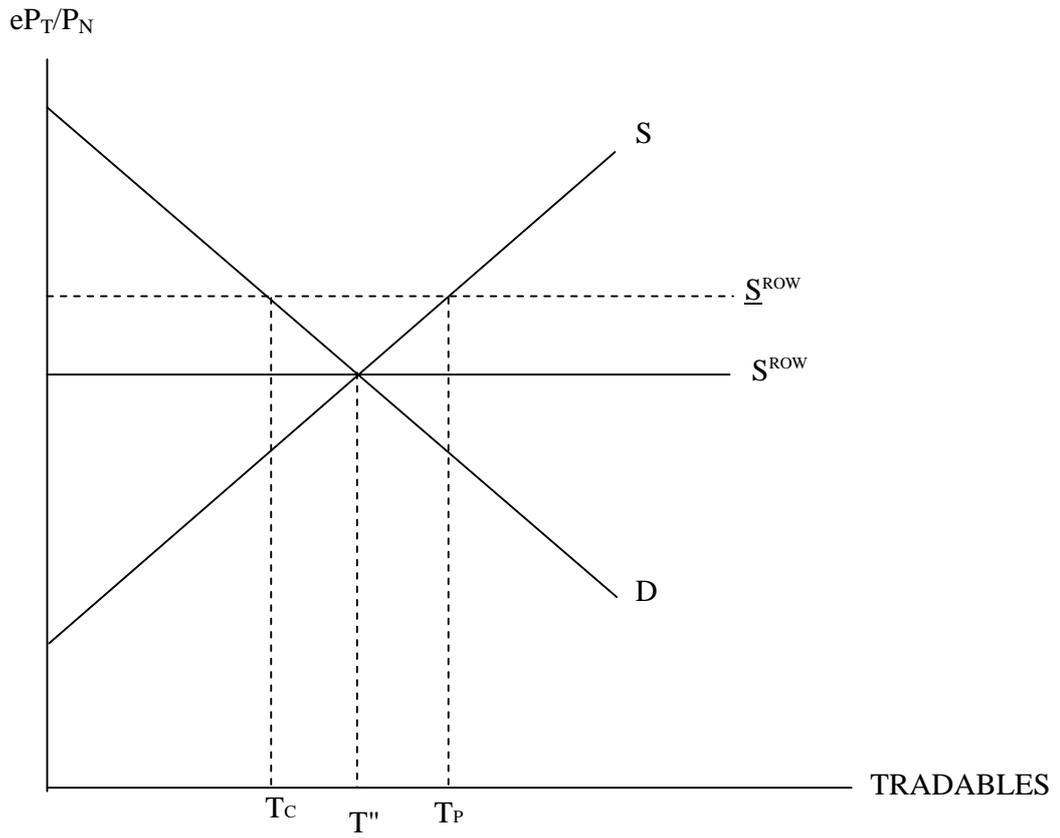
Diagrams 1a and 1b



Diagrams 2a and 2b



Diagrams 3a and 3b



Diagrams 4a and 4b

