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# Relationship between Currency Depreciation and Output Growth in Pakistan -A Time Series Study

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## *Abstract*

*Generally it is believed currency depreciation of a country has a positive that is expansionary impact on its output and aggregate demand. Since devaluation lowers the export prices and raises the prices of import and this leads to an improvement in the foreign sector of the economy. The improvement in the foreign sector raises output and employment in the overall economy. Thus currency devaluation or depreciation has a positive effect on its output. On the other hand it is also found that currency depreciation may not necessarily increase the level of output especially in a less developed economy. Since Exchange rate depreciation raises the cost of imported inputs, leading to a decrease in aggregate supply. Under these circumstances in this paper investigates the effects of currency depreciation on the growth of output of the economy of Pakistan for the time period 1993 to 2009. This study finds Currency depreciation has expansionary effect on output growth in the short run but in the long run currency depreciation is contractionary on output growth in the economy of Pakistan.*

**Key Words**: *Currency Depreciation, Real Effective Exchange Rate, Output Growth, Pakistan*

## Introduction

There are mainly two different views regarding the issue between the currency depreciation and its impact on output and aggregate demand. According to one thought (Gylfason, Schmid, Conolly) currency depreciation of a country has a positive that is expansionary impact on its output and aggregate demand. Since devaluation lowers the export prices and raises the prices of import and this leads to an improvement in the foreign sector of the economy. The improvement in the foreign sector raises output and employment in the overall economy. Thus currency devaluation or depreciation[1] has a positive effect on its output. This view is known as traditional approach. Marshall-learner's elasticities approach[2], absorption approach, Keynesian approach all suggest that devaluations have expansionary effect on output and aggregate demand.

Under the assumption that devaluations are expansionary, Pakistan like many other developing countries resorted to large devaluations in hope to reap economic benefits. During the Fixed Exchange Rate period (1971-81), the Pakistani rupee was devalued from 4.75 to 10.10 per US dollar. During the managed float period (1982-1999) the rupee was devalued from 10.10 to 51.78 per US dollar. During the flexible exchange rate period (2000-2009) the rupee has depreciated from 51.78 to 84.26 per US dollar.

Though there are a few factors that complicate this general relationship .1st ,for exchange rate to affect trade balances, export and import demand has to be responsive to price changes as prescribed by Marshall-Lerner condition.2nd is that there can be substantial lags between exchange rate movements and changes in trade balances. Thus the another group of thinkers (Krugman, Laylor, Lizondo, Montiel, Edwards etc) feel that currency depreciation may not necessarily increase the level of output specially in a less developed economy. According to their logic

1. Under a Fixed Exchange Rate system, official changes in the value of a country's currency relative to other currencies are called devaluation and revaluation. Whereas under Flexible Exchange Rate system, market forces generate changes in the value of the country's currency are known as depreciation and appreciation. In this study the terms depreciation and devaluation are used interchangeably.

2. The Marshall-Lerner condition states a devaluation/ depreciation will improve the trade balance only if the sum of foreign price elasticity of demand for exports and the home country price elasticity of demand for imports is greater than unity.

- Currency depreciation redistributes income from the group with higher MPC to the group with lower MPC. This may decline aggregate demand leading to a lower level of output in the economy
- Contractionary effects of exchange rate depreciation can also come through the supply side. Exchange rate depreciation raises the cost of imported inputs, leading to a decrease in aggregate supply.

- Currency depreciation may also raise the domestic interest rate and wage level through an increase in the price level. This may also decrease aggregate supply in the economy.
- Devaluation may lead to a negative real balance effect, due to a higher price level resulting in lower levels of aggregate demand and output.

**Study Done Before**

There are several major studies examining the impact of currency depreciation or devaluation on output. However the empirical findings of the effects of depreciation on the economy are mixed. *Krugman and Taylor* (1978) state that one of the conditions for currency devaluation to have a contradictory impact is whether exports are initially less than imports. *Conoly* (1983) found a positive relationship between currency depreciation and output growth. *Edwards* (1986*), Upadhyaya* (1999), *Bahmani-Oskooee* (2002), *Christopoulos* (2004) found that in empirical work currency devaluation or depreciation could have a contractionary, an expansionary, or no effect depending upon the time periods of the countries on which the study had done. *Chou and Chow* (2001) and *Bahmani-Oskooee and Kutan* (2008) indicate that depreciation or devaluation is ineffective or has little impact in the long-run. *Gylfason and Schmid* (1983), *Bahmani-Oskooee* (1997), *Gylfason and Risager* (1984) found depreciation have an expansionary effect for developed countries (except UK) on the other hand for developing countries, it has contractionary effect on output in the short-run as suggested by *Gylfason and Risager* (1984), *Ragers and Wang* (1995), *Moreno (*1999), *Kamin and Rogers* (2000), *Chou and Chao*(2001). *Bahmani-Oskooee and Miteza*(2006) for 24 non-OECD countries found depreciation has a negative effect on output. *Upadhyaya, Dhakal and Mixon* (2000) found currency depreciation were usually contractionary in selected Latin American countries and that the contractionary effect came from nominal exchange rate. *Upadhyaya, Mixon and Bhandari* (2004) reported short-run expansionary effects on output in Greece and Cyprus between 1969 and 1998 that emanated from both nominal devaluation and changes in the relative price level. Using Pooled time series data for 12 countries *Edwards (1986)* found that devaluations have a negative effect on output in the short-run. *Sheeley* also found a contractionary effect of devaluation on output for 16 Latin American Countries. *Christopoluous* (2004) found depreciation leads to a negative impact on output in the long-run in 11 Asian countries over the time period 1968-1999. *Asif and Rasid* (2010) found in Pakistan there exist long-run stable relationship between devaluation and trade balance. *Asif.M* and *Rashid.K (*2011) found both in the long and short-run output growth are affected positively by currency devaluations in Pakistan.

**Objective of the Study**:

Under these circumstances in this paper an attempt has been taken to investigate the effects of currency depreciation on output growth of the economy of Pakistan. Since currency devaluation has been one of the elements of the structural adjustment program of the IMF and World Bank in developing countries, it is therefore expected that this study will help to evaluate the success of such programs.

**Data Source and Methodological Issues**

This study uses annual observations for the period 1993 to 2009. Log of real Gross Domestic Product (LRGDP) of Pakistan and log of Real effective Exchange Rate( (LREER)[3]are the two variables of this study. The GDP is deflated by GDP deflator (with base 2005=100) These data are obtained from various issues of IFS data published by IMF.

**Methodology**

In this study a simple model is used to test the devaluation growth relationship.

$\text{Log RGDP}_t = \alpha + \beta \text{logREER}_t + \mu_t \quad (1)$

In this equation, if the estimated coefficient β is negative and statistically significant, ceteris paribus, exchange rate depreciation is contractionary to the economy. On the other hand, if the $\hat{\beta}$ is positive and statistically significant currency depreciation is expansionary to the economy. If it is statistically insignificant, the currency depreciation is neutral to real GDP growth. But before carrying out the estimation of above equation the time series properties of the series need to be investigated. Regression results are appropriate in estimating a long-run relationship if both the variables are stationary in same order. In this context, testing for unit roots is important to test the stationarity. If the variables are non-stationary, it has to be converted to stationary through filtering such as differencing, detrending etc.In this study the classical unit root test namely Augmented Dickey-Fuller (ADF) and Phillips-Perron Unit Root tests are used.

The ADF unit root test necessitate to run a regression of the 1st difference of the series concerned against the series lagged one ,lagged difference terms and specified deterministic components like intercept (constant) and a time trend. The test of stationarity of time series through ADF test, the following equation is to be estimated,

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \alpha_2 Y_{t-1} + \sum_{k=2}^{k} \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad (2)$$

In this equation Y is the variable under consideration, Δ is the first difference operator,t is a time trend and ε is a stationary random error.
Where, $\varepsilon_t$ represents a sequence of uncorrelated stationary error terms having zero mean and constant variance. k is the optimum lag which should be chosen in such a way that $\varepsilon_t$ will be free from autocorrelation. The null hypothesis is $H_0: \alpha_2 = 0$. If the null hypothesis is accepted the equation is entirely in first differences and has a unit root. Alternatively, rejection of $H_0: \alpha_2 = 0$ implies stationarity. $H_0: \alpha_2 = 0$ is examined by Dickey-Fuller statistic, where appropriate test

[3]Bahmani-Oskooee pointed out that a country's currency could depreciate against one country and appreciate against an other country and thus the real effective exchange rate is the appropriate to capture variation in the overall value of the currency. The weighted average of a country's currency relative to an index or basket of other major currencies adjusted for the effects of inflation. The weights are determined by comparing the relative trade balances in terms of one country's currency, with each other country with in the index.

The government of Pakistan took a series of reforms in the mid 90's and thereafter. Moreover the Structural Adjustment Programme (SAP) advocated by the World Bank and IMF is likely to have an impact on the overall macro-economy of Pakistan. Thus the use of ADF test for checking the stationary property of the data set given the presence of structural break might lead to misleading results ,(H.A .Ahmed & Md.G.S.Uddin,2009).hence we also apply Phillips—Perron Unit root test to test the presence of unit root under structural adjustment programme.Phillips and Perron (1988) have generalized the Dickey –Fuller tests to the situations where disturbance process $\varepsilon_t$ are serially correlated. The PP test is intended to add a '*Correction Factor*' to the DF test statistic. The PP test is based on the estimation of the following form of equation.

$$\Delta Y_t = \Phi + (\rho - 1)Y_{t-1} + \gamma(t - \frac{T}{2}) + \varphi \Delta Y_{t-i} + \xi_t \quad (3)$$

Having established that all the variables are integrated of the same order cointegration test is the appropriate method for detecting the existence of long-run relationship. Engle and Granger (1987) argue that , even though a set of economic series is not stationary, there may exist some linear combinations of the variables that are stationary. If the two series are non stationary at level but a linear combination of their levels is stationary, the series are cointegrated.
To examine the long run relationship , the number of significant cointegrating vectors, the deterministic component and error correction terms are determined simultaneously by using maximum likelihood based $\lambda_{max}$ and $\lambda_{trace}$ statistics suggested by Johansen (1991,1995) and Johansen and Juselius (1990,1994).

The presence of a cointegrating relation forms the basis of the Vector Error Correction **(VEC)** specification. The Vector Error Correction Modeling provides important information on the short-run relationship between any two cointegrated variables. The focus of the VEC Model analysis is the one period lagged error terms from the previously estimated cointegrating equations. This lagged term provide an explanation of the short-run deviations from the long-run equilibrium.

While testing the long-run dynamic relationship between model variables concerned, we may not make any a priory assumption of endogenity and exogenity of variables concerned. In such situation, *Vector Auto-regression Model* (**VAR**) can be used. This

model treats all variables systematically without making reference to the issue of dependence or independence. We have tried to apply all these techniques in this study.

**Empirical Findings**

Time plots of LRGDP and LREER show that, over the period of study LRGDP increases, where as LREER decreases. Now, an increase in the real exchange rate index is synonymous with appreciation where as a decrease in REER index is synonymous with depreciation. Hence declining pattern of REER implies devaluation or depreciation of Pakistani currency against the basket of currencies in which it has trade relations.

i) Both the variables in this study are I(1), according to both the ADF and PP unit root tests. That means at level , they are non-stationary but after 1st difference they became stationary.

ii) Engle-Granger two-step estimation of cointegration shows that the error series in both the cointegrating equations is stationary with exogenous none (as suggested by Enders). This implies though individually they are non-stationary but their linear combination is stationary. Hence the variables are cointegrated. This implies there exist a long-run relationship between the two variables (exchange rate depreciation and output growth) in Pakistan over the period of the study. Johansen's test of cointegration also supports E-G findings.

iii) To test the stability of the Long-run relationship we estimate the Vector Error Correction Model. It shows for the 1st cointegrating equation the Error Correction term ($\beta_1$) is not significant. Hence it implies the deviations from the long-run equilibrium is not significant. Indirectly it shows the stability of the long-run relationship. For the 2nd cointegrating equation the ECM term ($\gamma_1$) is significant. This means the long-run deviations are significant, but the estimated parameter is less than one, hence the deviations are damped to the long-run equilibrium path. The speed of adjustment is 13%. This means 13% error in the previous period is corrected in the present period. All these implies there exist a stable long-run relationship between currency depreciation and GDP growth in Pakistan over the period of Study.

iv) Moreover the VEC Model also implies estimated parameter $\gamma_4$ and $\gamma_5$ are positive and statistically significant. This implies, there exist *unidirectional causality from currency depreciation to output growth in the short-run*. This implies 1% depreciation or devaluation in last period would lead to 0.49% increase in real output in present period, where as 1% devaluation in last two

periods back would increase 0.33% real output in the current year. No other estimated parameter is statistically significant. The $R^2$, adjusted $R^2$ and F values indicate the reliability of the estimated model. The normality test of the residuals through JB statistic indicates the acceptance of the null hypothesis that is residuals are normal. This also provides some support on the reliability of the estimated model.

v) For investigating long-run causality we estimate Vector Auto Regression (VAR) model. Hence lag-selection criteria is very important. Most of the lag-selection criteria show (AIC, FPE,SC HQ etc) lag 4 is appropriate for testing long-run causal relationship.

vi) The estimated VAR model shows in the long-run GDP growth (at lag 2) positively affects real effective exchange rate growth this implies an appreciation or making Pakistani currency little bit stronger (1% increase in output growth leads to an appreciation of 1.54% of Pakistani currency) but the growth of REER that is depreciation is negatively affecting output growth (at lag4). 1% depreciation leads to 0.35% decrease in the growth of real GDP. *Therefore though in the short-run currency depreciation has expansionary impacts but in the long-run it is contractionary in the economy* of *Pakistan over the time horizon of the study.* Diagnostic checking confirms the stability of VAR model estimation.

**Summary and conclusion**

Whether devaluation of the currency affects output positively or negatively has received considerable attention both from academic and empirical researchers. Some studies got significant positive growth in the short as well as in the long-run. Some studies support contractionary devaluation hypothesis i.e. devaluation has contractionary effect on output. Under these circumstances an attempt has been taken in the present study (using yearly data series from 1993 to 2009 from the various issues of IFS) to explore the relationship between currency depreciation and output in the economy of Pakistan. This study finds that currency depreciation has an expansionary impact on output in the short-run, but in the long-run currency depreciation is contractionary on output growth in the economy of Pakistan over the period of the study. Though the transmission mechanism that is how currency depreciation is expansionary in the short-run or contractionary in the long-run has not been studied in this paper, it needs a serious effort by incorporating the channel of export, import elasticity , income redistribution channel, interest rate channel, investment channel, real balance channel etc on which currency depreciation and out put growth are directly or indirectly related.

## Appendix:

This paper is presented in SAP(DRS-II) ,National Seminer, Organised by the Department of Economics,N.B.U, on 20-21st March, 2012. The calculations are done by eviews 4.1

1. Appreciation /revaluation refers to the strengthening of a currency and depreciation/ devaluation is the opposite. Appreciation and depreciation are changes under floating exchange rate conditions, while revaluation/devaluation is brought about by the deliberate action of monetary authorities under a fixed exchange rate regime.
2. The Marshall-Lerner condition states a devaluation/ depreciation will improve the trade balance only if the sum of foreign price elasticity of demand for exports and the home country price elasticity of demand for imports is greater than unity.

Table-1 Results of ADF and PP Unit Root test

| Variable | Exogenous | ADF statistic | Prob. | PP-statistic | Prob. | Decision |
|---|---|---|---|---|---|---|
| LRGDP | Constant | -1.05 | 0.70 | -0.97 | 0.73 | |
| LRGDP | C+Ltrend | -3.20 | 0.13 | -2.57 | 0.29 | |
| D(LRGDP) | Constant | -4.70 | 0.00 | -4.47 | 0.00 | I(1) |
| D(LRGDP) | C+Ltrend | -4.49 | 0.01 | -4.49 | 0.01 | I(1) |
| LREER | Constant | -1.39 | 0.56 | -1.34 | 0.58 | |
| LREER | C+Ltrend | -1.49 | 0.78 | -1.51 | 0.78 | |
| D(LREER) | Constant | -5.04 | 0.00 | -4.93 | 0.00 | I(1) |
| D(LREER) | C+Ltrend | -5.18 | 0.00 | -5.17 | 0.00 | I(1) |

Table-2 Results of the estimation of equation 1 ($LREER_t = \alpha+\beta LRGDP_t+\mu_t$)

| parameter | Estimated value | se | t-value | Prob. |
|---|---|---|---|---|
| $\hat{\beta}$ | -2.32 | 0.47 | -4.88 | 0.00 |
| $\hat{\alpha}$ | 8.43 | 0.97 | 8.76 | 0.00 |

| Variable | Exogenous | ADF statistic | Prob. |
|---|---|---|---|
| $\mu_t$ | Constant | -3.10 | 0.05 |
| | None | -2.34 | 0.02 |

Table-3 Results of the estimation of equation 2 ($LRGDP_t = \alpha_1+\beta_1 LREER_t+\varepsilon_t$)

| parameter | Estimated value | se | t-value | Prob. |
|---|---|---|---|---|
| $\hat{\beta}1$ | 3.01 | 0.20 | 14.88 | 0.00 |
| $\hat{\alpha}1$ | -0.26 | 0.05 | -4.88 | 0.00 |

| Variable | Exogenous | ADF statistic | Prob. |
|---|---|---|---|
| $\varepsilon_t$ | Constant | -2.63 | 0.10 |
| | None | -2.58 | 0.01 |

Table-4 Results of Johansen's Cointegration tests ,Trend assumption: No deterministic trend

| No. of CE(s) | Trace Statisic | 5% C.V | 1% C.V | Max-Eigen Statistic | 5% C.V |
|---|---|---|---|---|---|
| None **(r=0) | 17.46 | 12.53 | 16.31 | 13.80 | 11.44 |
| At most 1($r \leq 1$) | 3.65 | 3.84 | 6.51 | 3.65 | 3.84 |

VEC Model Estimation:

$$\Delta LEER_t = \alpha + \beta_1 ECM_{t-1} + \beta_2 \Delta LEER_{t-1} + \beta_3 \Delta LEER_{t-2} + \beta_4 \Delta LRGDP_{t-1} + \beta_5 \Delta LRGDP_{t-2} + \mu_{1t}$$

$$\Delta LRGDP_t = \delta + \gamma_1 ECM_{t-1} + \gamma_2 \Delta LRGDP_{t-1} + \gamma_3 \Delta LRGDP_{t-2} + \gamma_4 \Delta LREER_{t-1} + \gamma_5 \Delta LREER_{t-2} + \mu_{2t}$$

Table-5 Results of Vector Error Correction Model

| D.V | $\alpha$ | $\beta_1$ | $\beta_2$ | $\beta_3$ | $\beta_4$ | $\beta_5$ |
|---|---|---|---|---|---|---|
| $\Delta LEER_t$ | -0.01 | -0.11 | -0.11 | 0.31 | 0.04 | 0.44 |
| S.E | 0.02 | 0.08 | 0.41 | 0.39 | 0.65 | 0.40 |
| t- Value | -0.94 | -1.29 | -0.26 | 0.79 | 0.07 | 1.11 |
| $R^2$=0.38, Ad. $R^2$ = -0.01, F=0.97 | | | | | | |
| D.V | $\delta$ | $\gamma_1$ | $\gamma_2$ | $\gamma_3$ | $\gamma_4$ | $\gamma_5$ |
| $\Delta LRGDP_t$ | 0.02 | -0.13 | -0.23 | 0.20 | 0.49 | 0.33 |
| S.E | 0.01 | 0.03 | 0.25 | 0.16 | 0.16 | 0.15 |
| t- Value | 3.60 | -3.71 | -0.91 | 1.30 | 3.11 | 2.18 |
| $R^2$=0.68, Ad. $R^2$ = 0.48, F=3.48 | | | | | | |

Table-5 VEC Residual Normality Tests

| $H_0$: Residuals are multivariate Normal | | |
|---|---|---|
| JB Statistic | df | Prob |
| 6.39 | 4 | 0.17 |

Table-6 VAR Lag- Selection Criteria

| Included observations: 12 | | | | | | |
|---|---|---|---|---|---|---|
| Lag | LogL | LR | FPE | AIC | SC | HQ |
| 0 | 73.99905 | NA* | 2.11E-08 | -11.99984 | -11.91902 | -12.02976 |
| 1 | 76.96775 | 4.453049 | 2.56E-08 | -11.82796 | -11.58550 | -11.91772 |
| 2 | 81.38943 | 5.158626 | 2.60E-08 | -11.89824 | -11.49415 | -12.04785 |
| 3 | 84.25337 | 2.386618 | 3.95E-08 | -11.70889 | -11.14317 | -11.91835 |
| 4 | 95.57580 | 5.661216 | 2.03E-08* | -12.92930* | -12.20194* | -13.19859* |

*Indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

VAR Model:

$$LREER_t = \alpha + \beta_i \sum_{i-1}^{k} LREER_{t-i} + \gamma_i \sum_{i=1}^{k} LRGDP_{t-i} + \mu_{1t}$$

$$LRGDP_t = \delta + \psi_i \sum_{i-1}^{k} LRGDP_{t-i} + \phi_i \sum_{i=1}^{k} LREER_{t-i} + \mu_{2t}$$

Table-7 Results of VAR Model Estimation

| D.V | | Estimated Parameter | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *LREER* | $\beta_1$ | $\beta_2$ | $\beta_3$ | $\beta_4$ | $\gamma_1$ | $\gamma_2$ | $\gamma_3$ | $\gamma_4$ |
| | -0.68132 | -0.31205 | -0.45428 | -0.34110 | 0.90492 | 1.5406 | -0.2313 | 0.7481 |
| s.e | 0.4643 | 0.5546 | 0.3533 | 0.3698 | 0.9998 | 0.6860 | 0.8880 | 0.5660 |
| t-value | -1.4673 | -0.5625 | -1.2857 | -0.9222 | 0.9050 | 2.2456 | -0.2605 | 1.3217 |
| D.V | | Estimated Parameter | | | | | | |
| $LRGDP_t$ | $\Psi_1$ | $\Psi_2$ | $\Psi_3$ | $\Psi 4$ | $\Phi_1$ | $\Phi_2$ | $\Phi_3$ | $\Phi_4$ |
| | -0.3318 | 0.5025 | -0.5527 | -0.2014 | 0.3549 | 0.3032 | -0.2406 | -0.3451 |
| s.e | 0.5006 | 0.3435 | 0.4446 | 0.2834 | 0.2324 | 0.2777 | 0.1769 | 0.1851 |
| t-value | -0.6629 | 1.4628 | -1.2432 | -0.7108 | 1.5267 | 1.0920 | -1.3601 | -1.8640 |

Diagnostic Checking:

| Roots of Characteristic Polynomial | |
|---|---|
| Endogenous variables: DLREER DLRGDP | |
| Exogenous variables: C | |
| Root | Modulus |

| | |
|---|---|
| 0.822456 - 0.565039i | 0.997849 |
| 0.822456 + 0.565039i | 0.997849 |
| -0.974595 - 0.199380i | 0.994781 |
| -0.974595 + 0.199380i | 0.994781 |
| -0.555162 - 0.601835i | 0.818786 |
| -0.555162 + 0.601835i | 0.818786 |
| 0.200690 - 0.674300i | 0.703532 |
| 0.200690 + 0.674300i | 0.703532 |
| No root lies outside the unit circle. | |
| VAR satisfies the stability condition. | |

**Data:**

| year | gdp deflat | base 2005 | reer | base 2005 | nomi.gdp | real gdp | base 2005 |
|---|---|---|---|---|---|---|---|
| 1993 | 49.1 | 36.91729 | 111.42 | 118.5319 | 1332.8 | 3610.232 | 118.5319 |
| 1994 | 50.3 | 37.81955 | 111.44 | 118.5532 | 1561.1 | 4127.759 | 118.5532 |
| 1995 | 57.2 | 43.00752 | 110.72 | 117.7872 | 1865.9 | 4338.544 | 117.7872 |
| 1996 | 61.9 | 46.54135 | 107.28 | 114.1277 | 2120.2 | 4555.519 | 114.1277 |
| 1997 | 70.9 | 53.30827 | 108.79 | 115.734 | 2428.3 | 4555.203 | 115.734 |
| 1998 | 76.3 | 56.8 | 106.75 | 114.8 | 2677.7 | 4714.261 | 114.8 |
| 1999 | 80.8 | 60.1 | 99.49 | 107 | 2938.4 | 4889.185 | 107 |
| 2000 | 100 | 75.1 | 100 | 107.6 | 3793.44 | 5051.185 | 107.6 |
| 2001 | 107.9 | 81 | 91.48 | 97.5 | 4209.87 | 5197.37 | 97.5 |
| 2002 | 110.5 | 83 | 94.79 | 100.9 | 4452.65 | 5364.639 | 100.9 |
| 2003 | 115.5 | 86.7 | 91.8 | 97.6 | 4875.65 | 5623.587 | 97.6 |
| 2004 | 124.4 | 93.4 | 91.12 | 96.8 | 5640.58 | 6039.165 | 96.8 |
| 2005 | 133.1 | 100 | 94 | 100 | 6499.78 | 6499.78 | 100 |
| 2006 | 145.5 | 110.5 | 96.97 | 103.1 | 7593.85 | 6872.262 | 103.1 |
| 2007 | 156.8 | 118.9 | 97.18 | 102.7 | 8706.92 | 7322.893 | 102.7 |
| 2008 | | 138.2 | | 99.9 | 10242.8 | 7411.577 | 99.9 |
| 2009 | | 165.9 | | 100.9 | 12739.34 | 7678.927 | 100.9 |
| | | deflator | | reer,2005 | | | reer |
| | | | | base | | | |

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