Estimates of Quarterly Real GDP for Vietnam

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Abstract

The lack of sufficient quarterly data on output is often a problem confronting research on the Vietnamese economy which has been attracting attention from academicians as well as policy makers. This paper provides estimates of quarterly real GDP in the period 1992q1-2007q4 for Vietnam using the Chow-Lin method. A contribution is that, instead of choosing the related series ad hoc as often done by several previous studies, I choose the interpolators, namely the nominal interest rate and real money supply, based on a theory: the LM curve. Despite the very limited data of a developing and transition country like Vietnam, this choice is feasible, and the quality of interpolated data turns out to be fairly good. The approach of this paper might be used for such cases as quarterly-monthly GDP interpolation.

Keywords: Vietnamese economy, GDP data, Chow-Lin method, LM curve.
JEL Classification:

1. Introduction

Since the start of *Doi Moi*[1] policies, which began in 1986 and virtually took effect at the outset of the 1990s, the Vietnamese economy has changed substantially from a centrally planned economy toward a more market-oriented one. The stable and rapid economic growth over the last two decades has worked to increase the living standard, reduce poverty markedly, and at the same time steadily enhance the presence of Vietnam in the region and in the world.

The Vietnamese economy itself has been attracting more and more attention of academicians as well as policy makers both internationally and domestically, and has been the subject of an increasing number of studies. A problem arising when conducting empirical research on Vietnam, especially in the field of macroeconomics, is the lack of

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[1] This is a Vietnamese term which means reform.

time series data at frequencies higher than annual, among which the lack of quarterly real GDP data is often encountered. Since quarterly real GDP data is available only from 1999q1 which is not sufficient, studies that need to use quarterly output data must rely on industrial output data as a proxy. This is unsatisfactory and may even cause incorrect results because during the course of growth over the last two decades the structure of the Vietnamese economy has changed substantially (the share of industrial output has changed largely during the period, with the number being 29% in 1986, 23% in 1990, 32% in 1997, and 40% in 2003, according to the World Development Indicators 2008). Using industrial output as a proxy for GDP may overlook the important effect of the interaction between the industrial sector and other sectors in an economy changing dynamically like that of Vietnam.

On the other hand, there already exist several econometrical methods to estimate GDP data which is not observed for some period in the past. A natural idea is why not utilize these available resources. The purpose of this paper is thus to provide estimates of quarterly real GDP for Vietnam. I apply the Chow-Lin method, which is regarded as relatively reliable, to interpolate quarterly real GDP from annual real GDP and related series. A contribution of this paper is that, instead of choosing the related series ad hoc as often done by several studies in the literature, I choose the interpolators, namely the nominal interest rate and real money supply, based on a theory: the LM curve which expresses the equilibrium in money market, with which the cointegration relationship between real GDP and the interpolators is guaranteed. Despite the very limited data of a developing and transition country like Vietnam, this choice is feasible, and I in fact obtain results with quite a good quality. The approach of this paper might be used for such cases as quarterly-monthly GDP interpolation.

The remainder of the paper is organized as follows. Section 2 briefly explains the Chow-Lin method. Section 3 discusses the choice of related series and the data. Section 4 explains the calculation procedure, and Section 5 analyzes the results obtained. Section 6 concludes.

2. A brief description of the Chow-Lin method

For the purpose of this paper, below we will briefly explain the Chow-Lin method for interpolating quarterly GDP data from annual GDP data and quarterly data of related series. As noted by Chow and Lin (1971), with a few revisions the method can be applied for cases such as quarterly-monthly interpolation and so on.

In what follows we will let the subscripts a and q denote "year" and "quarter", respectively. Suppose that the annual data of GDP (y_a) is available for n years, and the data for the k related variables ($x_{q,1},\dots,x_{q,k}$) are available at the quarterly frequency of the same sample period. We need to interpolate quarterly GDP, y_q, from y_a and $x_{q,1},\dots,x_{q,k}$. Let C be the $n\times 4n$ matrix that converts quarterly GDP data to annual one, we have

$$Cy_q = y_q, \qquad (1)$$

$$C = \begin{bmatrix} 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & \dots & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & \dots & 0 & 0 & 0 & 0 \\ & \dots & & & & \dots & & & \dots & & \dots & & \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dots & 1 & 1 & 1 & 1 \end{bmatrix}. \qquad (2a)^2$$

Note that C takes the form in (2a) because GDP is a flow variable so that its annual value is the sum of the values of the four quarters in the same year. For the case of a stock variable

$$C = \frac{1}{4}\cdot\begin{bmatrix} 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & \dots & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & \dots & 0 & 0 & 0 & 0 \\ & \dots & & & & \dots & & & \dots & & \dots & & \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dots & 1 & 1 & 1 & 1 \end{bmatrix} \qquad (2b)$$

which corresponds to the case of period-average values, or

$$C = \begin{bmatrix} 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & \dots & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & \dots & 0 & 0 & 0 & 0 \\ & \dots & & & & \dots & & & \dots & & \dots & & \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dots & 0 & 0 & 0 & 1 \end{bmatrix}, \qquad (2c)$$

for the case of end-of-period values.

Suppose that the quarterly GDP can be explained by the related variables according to the following multiple regression equation

$$y_q = X_q\beta + u_q, \qquad (3)$$

where $X_q = \begin{bmatrix} x_{q,1} & x_{q,2} & \dots & x_{q,k} \end{bmatrix}$ is a matrix of size $4n\times k$, β is the coefficient vector of size

[2] In practice when writing a computer code to calculate, it is useful to write $C=I_n\otimes[1 \quad 1 \quad 1 \quad 1]$, where I_n is the $n\times n$ identity matrix and $\otimes$ denotes the Kronecker product.

$1 \times k$, and u is a $4n \times 1$ random vector with mean zero and covariance matrix V_q of size $4n \times 4n$. Pre-multiply both sides of (3) by C and use (1) to have a regression equation of the annual variables

$$Cy_q = y_a = CX_q\beta + Cu_q = X_a\beta + u_a \tag{4}$$

with $X_a = CX_q$ and $u_a = Cu_q$. As shown by Chow and Lin (1971), solving for the best linear unbiased estimator of y_q results in the estimator of β which is exactly the GLS estimator of β using annual data in the regression equation (4),

$$\hat{\beta} = \left(X_a' V_a^{-1} X_a\right)^{-1} \left(X_a' V_a^{-1} y_a\right), \tag{5}$$

where $V_a = CV_qC'$. It thus follows that the estimator of y_q is

$$\hat{y}_q = X_q\hat{\beta} + V_qC'\left(CV_qC'\right)^{-1} \hat{u}_a , \tag{6}$$

where $\hat{u}_a = y_a - X_a\beta$, the GLS residual in equation (4). It is easy to confirm that $C\hat{y}_q = y_a$, which means that the Chow-Lin method interpolates quarterly data such that the interpolated data in the four quarters of one year sum up to exactly the annual data observed.

To calculate $\hat{\beta}$ and $\hat{y}_q$ in (5) and (6) we need to make some assumptions regarding the covariance matrix V_q , which is unknown in practice. Chow and Lin (1971) consider two cases: (i) the quarterly regression residuals are serially uncorrelated, each with variance σ^2, so $V_q = \sigma^2 I_{4n}$; and (ii) the quarterly regression residuals are AR(1): $u_{q,t} = \rho_q u_{q,t-1} + \varepsilon_t$ with ε_t being white noise with $\mathrm{var}(\varepsilon_t) = \sigma^2_\varepsilon$. In the first case, $\hat{\beta}$ becomes the OLS estimator of β, and $V_qC'\left(CV_qC'\right)^{-1} \hat{u}_a = C'\left(CC'\right)^{-1} \hat{u}_a = \left(1/4\right)C'\hat{u}_a$ which mean that one fourth of the GLS residual in one year is allocated to each quarter of that year. In the second case, which is more general and will be adopted later, we could write

$$V_q = \begin{bmatrix} 1 & \rho_q & \rho_q^{\,2} & \cdots & \rho_q^{\,4n-1} \\ \rho_q & 1 & \rho_q & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ \rho_q^{\,4n-1} & \rho_q^{\,4n-2} & \rho_q^{\,4n-3} & \cdots & 1 \end{bmatrix} . \tag{7}$$

The parameter ρ_q is the first-order autocorrelation coefficient of the quarterly OLS residuals in the regression equation (3), and can be calculated from the following relationship with the first-order autocorrelation coefficient of the annual OLS residuals in equation (4), ρ_a,

$$\rho_a = \frac{\rho_q^7 + 2\rho_q^6 + 3\rho_q^5 + 4\rho_q^4 + 3\rho_q^3 + 2\rho_q^2 + \rho_q}{2\rho_q^3 + 4\rho_q^2 + 6\rho_q + 4} . \qquad (8)^3$$

Or if there is sufficient GDP quarterly data for some sub-sample period, we can run equation (3) using OLS method and calculate ρ_q directly.[4]

3. The choice of related variables and data

An important point from the regression eq. (1) is that, because GDP is often non-stationary, the related variables (the interpolators) must be cointegrated with it in order to obtain stationarity of the error term. This implies that the quality of the results will depend crucially on whether such related variables are chosen or not.

Overall, existing studies in the literature applying the Chow-Lin method to interpolate GDP adopt either one of the following two strategies, which differ in the choice of related variables. The first strategy is to separately interpolate each of components of GDP, to which the data on some kind of indexes or variables that are very closely related are available. The choice of related variables in this case, thus, is straightforward: just choose these indexes or variables. For example, in Bernanke and Mihov (1995) in which the U.S. monthly GDP is obtained by interpolating each of its components, the monthly interpolators for the producers' durables investment component are industrial production index of business equipment, shipments of non-defense capital goods, and shipments of machinery and equipment. In another study to interpolate quarterly GDP for Malaysia, Abeysinghe and Lee (1998) separately interpolate quarterly GDP for each of the three sectors, namely industry, agriculture, and service, among which the related variables for industry and agriculture are agricultural production index and industrial production index, respectively.[5] As seen in Abeysinghe and Lee (1998), interpolating this way often yields results with very high quality, because the interpolators are highly cointegrated with GDP.

The second strategy is to interpolate to GDP directly, and in this case the choice of the related variables is more difficult and often made in an ad hoc manner: just

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[3] There will be a unique real solution of ρ_q which has the same sign with ρ_a and has the absolute value between zero and unity.

[4] It can be proved that the OLS estimator of ρ_q converges in probability to itself. See Hamilton (1994), pp. 224.

[5] The interpolators for service sector are total commercial bank loans and trade. The choice of these variables here is similar to that of the second strategy, which is ad hoc.

try various candidates and see the results. One example is Abeysinghe and Rajaguru (2004), a study on four ASEAN countries and China, in which the related variables are mining and manufacturing indexes and M1 for Indonesia, and trade volume and M1 for China. It is clear that although the interpolators chosen above are conceivably "related" to GDP, no explicit theoretical background is explained to guarantee stationarity of the error term.

For the case of Vietnam, due to its situation of a transition country, it should be noted that the constraint on data is very strict in both the number of series and the length of sample period. The only data on components of GDP available at the quarterly frequency are those of industrial output (1991q1-) and trade volume (1993q1-). But these do not suffice to use the first strategy noted above. Consequently, we have to rely on the second strategy. Given the limited data set obtained, I choose nominal interest rates and real money supply as the related variables. This choice has a clear advantage over that of the studies using the second strategy noted above in that it is based on an explicit theoretical foundation: the LM curve which expresses the equilibrium in the money market, with which the cointegration relationship between output and the interpolators is guaranteed.[6] I will discuss this issue in a little more detail below. For a related study, see my previous paper (Vu (2012)) in which I estimate money demand functions for Vietnam using double-log and semi-log functional forms.

According to the theory of demand for money, the relationship between the demand for real balances (defined as the ratio of nominal balances to the price level, and denoted by m^d) and nominal interest rates (r) and real GDP (y) can be expressed by the following money demand function:

$$m^d = m^d(r, y), \qquad (9)$$

where $\partial m^d(r, y)/\partial y > 0$, and $\partial m^d(r, y)/\partial r < 0$. This function can be derived by modeling the famous three motives of holding money of people advocated by Keynes: transactions motive, precautionary motive, and speculative motive.[7]

If the money market is in equilibrium, money demand equals money supply (m^s),

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[6] As in Cashin (1995), one can also estimate real GDP by using the quantity theory of money identity, an approach different from that used here. But it is not possible to apply this approach here because the data on the velocity of money of Vietnam is not available.

[7] For a more detail about the demand for money, see, for example, Dornbusch et al. (2001), ch. 15.

$m^d = m^s = m$, and thus we have

$$m = m^d(r, y). \tag{10}$$

From (10), we could deduce a relationship between real GDP and nominal interest rates and real money supply as follows

$$y = y(m, r), \tag{11}$$

where $\partial m^d(r, y)/\partial y > 0$, and $\partial m^d(r, y)/\partial r < 0$. Assuming linearity, we could write our estimated model as follows

$$y = \alpha_o + \alpha_m m + \alpha_r r + e_t, \tag{12}$$

where α_m and α_r are coefficients, α_o is the constant term, and e_t is the error term. The sign of α_m is expected to be plus. That of α_r is theoretically plus, but since I use data of M2 and the interest rate of time deposits which is part of M2, so α_r can be either positive or negative. Another point which should be noted is that conventionally the logs of output and real money supply are used in the estimation of the regression model (12), but in this paper we must use their levels to maintain the relationship that the quarterly values of one year sum up to the annual value of that year.

The choice of M2, instead of M1, here has to do with the dollarization which has been prevailing in the Vietnamese economy. Vietnam is known as a mildly dollarized country,[8] where together with the dong (the national currency) the dollar is used quite widely as a store of value and unit of account, and partly as means of payment (though decreasingly recently due to the regulations of the government).[9] It is thus necessary to take into account this fact when considering the equilibrium in money market of Vietnam. Since M1 is defined as the sum of national currency (dong) and demand deposits denominated in dong, while M2 is defined as the sum of M1 and time deposits denominated in dong and foreign currency (the dollar),[10] it is clearly more appropriate

8 According to ADB (2008), the ratio of foreign currency deposits to broad money, an indicator of dollarization, is about 25~30% in the first half of the 2000s.

9 For more about the dollarization in Vietnam, see Vo Tri Thanh et al. (2000), Adam et al. (2004), and Goujon (2006), among others.

10 Note that to a certain extent gold has also been used, especially as a store of value. Moreover, there should have been some volume of foreign currencies (the dollar, euro etc) being circulated outside banks. But the data on these variables are not available.

to use the latter.

The data set used in this study contains quarterly data of annual real GDP of the period 1992-2007, and nominal three-month deposit interest rates, nominal money supply (M2), and the consumer price index of the period 1992q1-2007q4, among which the last two series are used to calculate quarterly real money supply. In addition, quarterly data of real GDP is available for the period 1999q1-2007q1, which is sufficient to calculate the coefficient ρ_q noted in Section 2, and can also be used for comparing with the interpolated data in the overlapping period. The data sources are CEIC Database, IFS online March 2009, Asia Regional Integration Center's Economic and Financial Indicators Database, statistical materials by the General Statistics Office (GSO) of Vietnam and the State Bank of Vietnam.

4. Procedure

To be concrete, the interpolating procedure consists of the following steps.

Step 1 (processing data): Note that, similarly to that of GDP, the data of money supply and the interest rate must be constructed such that the values of four quarters in one year sum up to exactly the annual value of that year (see eqs (2a)-(2c), and (4) in Section 2). Although annual data on money supply and the interest rate are available, they can not be used because they are end-of-period values. Instead, I construct annual data of these variables by calculating the average of the four quarters of the corresponding year. These data thus mean period-average values, and are used for interpolating after being multiplied by four to guarantee the relation in eq. (4).

Step 2 (de-seasonalizing data): Since the quarterly data of nominal money supply, interest rates, and inflation obtained do not show any seasonal pattern, while that of GDP does, I de-seasonalize the GDP data by using the procedure suggested by Harvey (1989) as follows.

$$\begin{aligned} y_{q,t} &= \mu_t + \gamma_t + \varepsilon_t \\ \mu_t &= \mu_{t-1} + \beta_{t-1} + \eta_t \\ \beta_t &= \beta_{t-1} + \varsigma_t \\ \gamma_t &= -\gamma_{t-1} - \gamma_{t-2} - \gamma_{t-3} + \omega_t \end{aligned} \tag{13}$$

Here, μ_t is the trend component which is assumed to be a random walk with a drift factor β_t which in turn follows an unit-root process, γ_t is the seasonal component, and the error terms ε_t, η_t, ς_t, and ω_t are assumed to be mutually orthogonal white-noise processes with zero means and constant variances σ_ε^2, σ_η^2, σ_ς^2, and σ_ω^2, respectively. Also, the trend component and the seasonal component are assumed to be uncorrelated. The system in eq. (13) can be estimated using the Kalman filter technique, and the smoothing algorithms can be utilized to obtain the best estimates of the state variables. After doing this, we obtain the de-seasonalized data of quarterly GDP, $y_{q,t}^{sa} = \mu_t$, and the sequence of the seasonal component which can be used to calculate backward using the last equation in (13) to obtain the seasonal component up to 1992q1.

Step 3 (estimating ρ_q) : Run the regression of eq. (3) for the period 1999q1-2008q4 (in which quarterly data of GDP is available) using de-seasonalized GDP data, and calculate the first-order autocorrelation coefficient ρ_q from the residuals u_q.

Step 4 (calculating $\hat{y}_q^{sa}, \hat{y}_q$) : The de-seasonalized GDP $\hat{y}_q^{sa}$ is calculated using eqs. (5)-(7), while the seasonally-unadjusted GDP $\hat{y}_q$ is calculated as the sum of $\hat{y}_q^{sa}$ and the seasonal component obtained in Step 2.

Step 5 (calculating RMSE%) : Following Abeysinghe and Lee (1998), to assess the quality of the interpolated data, the root mean squared errors (RMSE%) expressed as a percentage of the mean of actual GDP is calculated for both $\hat{y}_q^{sa}$ and $\hat{y}_q$ series.

5. Results

Table 1 shows the regression results of real GDP on real money supply and nominal interest rates using quarterly data of the sample period 1999q1-2007q4 (eq. (12)).

Table 1: OLS regression of real GDP on real money supply and nominal interest rates

Dependent Variable: Real GDP
Sample Period: 1999q1-2007q4

Variable	Coefficient	Std. Error	t-Statistic	P-value
Constant term	51521.3	1996.3	25.8	0.00
Real money supply	42.7	1.3	33.3	0.00
Nominal interest rates	825.2	339.2	2.4	0.02
R-squared: 0.978		Adj. R-squared: 0.977		

We can see that the coefficient on real money supply (α_m) is positive, as expected. That of the nominal interest rate (α_r) is positive too. In addition, all three coefficients are significant at the 2% level. From this regression, the value of the first-order auto-correlation coefficient of the residual term obtained is ρ_q=0.84, which is in turn used to calculate GDP.

Figures 1 and 2 show the graphs of actual and interpolated GDP for Vietnam. Overall, the interpolated values fit the actual quite well in the overlapping period 1999q1-2007q4 for both seasonally adjusted and unadjusted series. The detailed data are provided in Table A of the Appendix at the end of the paper.

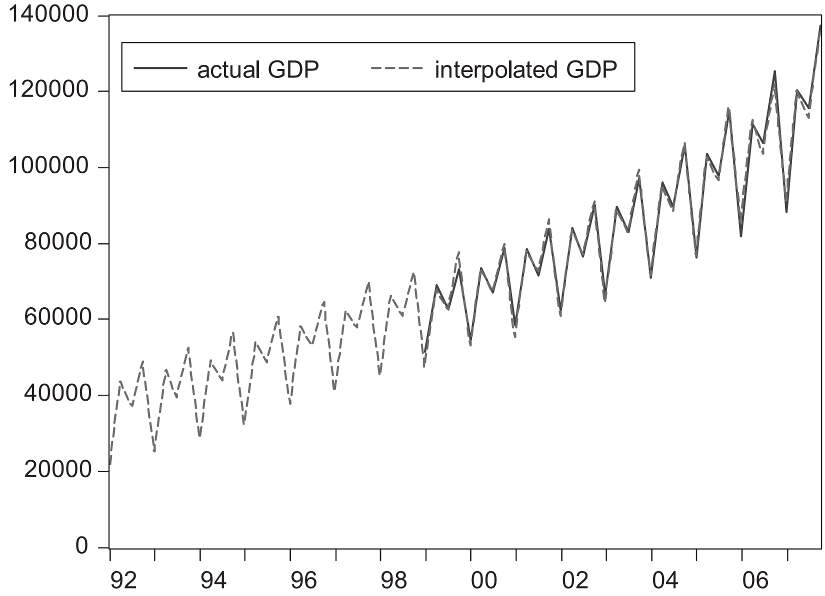

Figure 1: Actual and interpolated quarterly GDP of Vietnam, seasonally unadjusted (1994 prices, in billion Vietnamese dong)

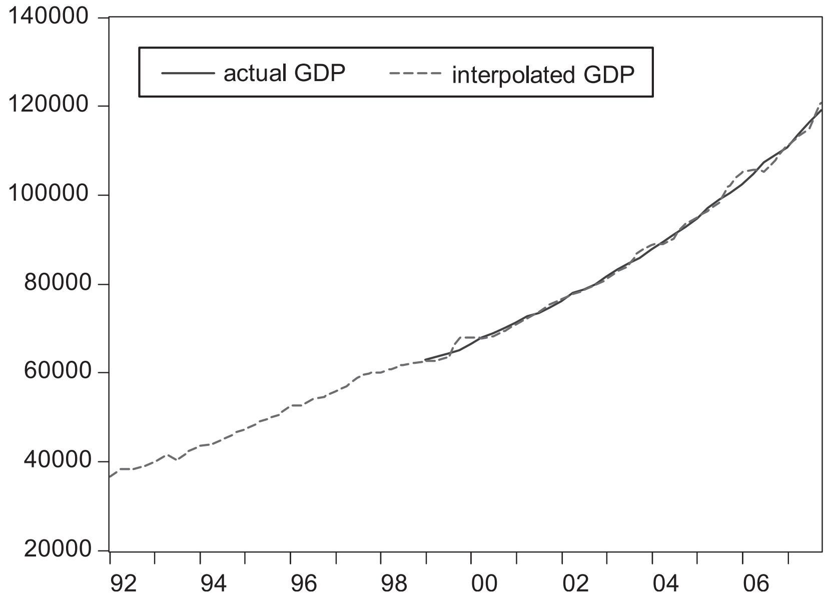

Figure 2: Actual and interpolated quarterly GDP of Vietnam, seasonally adjusted (1994 prices, in billion Vietnamese dong)

The quality of interpolated data can be assessed more formally by using the RMSE% calculated as a percentage of the mean of actual GDP in the overlapping period 1999q1-2007q4. The smaller is this number, the higher is the quality. The results are shown in Table 2. For comparison, we also cite the results of Abeysinghe and Lee (1998) who apply the Chow-Lin method for the case of Malaysia, but with a much better data set so that the first strategy can be adopted, as noted in Section 3.

Table 2: RMSE% over mean of actual GDP in the overlapping period 1999q1-2007q4

	This paper	Abeysinghe and Lee (1998), the case of Malaysia			
		GDP	Agriculture	Industry	Service
Seasonally unadjusted	2.18	0.58	0.81	1.51	1.83
Seasonally adjusted	1.23	0.47	0.78	1.47	1.75

We can see that, the number for seasonally unadjusted series is a little high, and higher than all corresponding numbers for Malaysia. The number for the seasonally unadjusted series, however, is relatively small, and even smaller than that for Industry and Service of Malaysia (although the result of Malaysia is still superior for the case of the GDP series). This implies a fairly good quality of the estimates in the paper given the strict constraint on data for Vietnam.

6. Concluding Remarks

This paper applies the Chow-Lin method to interpolate quarterly GDP for Vietnam in the period 1992q1-2007q4. One contribution of the paper is that, instead of being chosen ad hoc, the related series (the nominal interest rate and real money supply) are chosen based on a theory: equilibrium in money market (or the LM curve), and as a result, they are cointegrated with GDP. Despite the strict constraint on data of Vietnam, a developing and transition country, this choice of the related series is feasible, and the quality of interpolated data turns out to be fairly good compared to existing studies. The method used in this paper might be applicable, especially when available data are limited, to other cases such as quarterly-monthly disaggregation where monthly GDP data may be needed as in Bernanke and Mihov (1995).

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World Development Indicators 2008, CD-ROM.

Appendix

Table A: Actual and estimated real GDP of Vietnam

Periods	Actual GDP, original series	Actual GDP, seasonally adjusted series	Estimated GDP, original series	Estimated GDP, seasonally adjusted series
1992q1	na	na	21834	36638
1992q2	na	na	43701	38280
1992q3	na	na	37249	38043
1992q4	na	na	49017	38821
1993q1	na	na	25136	39939
1993q2	na	na	46758	41337
1993q3	na	na	39513	40307
1993q4	na	na	52657	42460
1994q1	na	na	28809	43613
1994q2	na	na	49274	43853
1994q3	na	na	44059	44853
1994q4	na	na	56412	46216
1995q1	na	na	32359	47162
1995q2	na	na	53915	48494
1995q3	na	na	48719	49513
1995q4	na	na	60595	50398
1996q1	na	na	37857	52661
1996q2	na	na	58114	52693
1996q3	na	na	53190	53984
1996q4	na	na	64692	54496
1997q1	na	na	41045	55848
1997q2	na	na	62318	56897
1997q3	na	na	57954	58748
1997q4	na	na	69967	59771
1998q1	na	na	45291	60095
1998q2	na	na	66183	60762

1998q3	na	na	60871	61665
1998q4	na	na	72272	62075
1999q1	51576	62915	47596	62399
1999q2	68930	63534	67994	62573
1999q3	62613	64366	62612	63406
1999q4	73151	65151	77784	67587
2000q1	54477	66474	53016	67880
2000q2	73561	67829	73136	67648
2000q3	66943	68803	67336	68238
2000q4	78685	70010	79817	69350
2001q1	58368	71286	55493	70684
2001q2	78637	72610	77986	72344
2001q3	71589	73501	72537	73580
2001q4	83941	74545	86247	75335
2002q1	62213	76118	60925	76644
2002q2	84173	77927	83543	77697
2002q3	76681	78576	77213	78416
2002q4	90180	79822	91193	79685
2003q1	66441	81567	64556	80955
2003q2	89610	83273	88766	82709
2003q3	82902	84677	82933	84285
2003q4	97289	85758	99535	87327
2004q1	71080	87685	71473	88675
2004q2	95954	89557	95297	88998
2004q3	89537	91103	88578	90092
2004q4	105864	92857	106421	93437
2005q1	76371	94783	76965	95042
2005q2	103670	97194	102834	96279
2005q3	97829	99118	96521	98183
2005q4	115119	100505	115830	102096
2006q1	81984	102333	85952	104873
2006q2	111361	104845	112526	105722
2006q3	106416	107412	103490	105287
2006q4	125374	109056	122146	107762
2007q1	88263	110646	91237	110877
2007q2	120257	113554	120074	113043
2007q3	115706	116495	113221	115124
2007q4	137217	119107	135567	120758