

Thomas G. Rawski [tgrawski+@pitt.edu]
Notes on Calculation of Chinese Aggregate Output Growth 1997/98
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Comment invited.

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FORMULA

Income side calculation:

$$\text{National Income} = W + I + R + PR + T + D + P$$

Wages W

Interest I

Rent R [omitted, except for imputed rental on housing]

Property income PR [omitted]

Indirect tax T

Depreciation D

Profit P

Housing H

DATA SOURCES

See list at the end of these notes.

PRICE BASE

Income-side calculation is only feasible in nominal terms - there is no price index suitable for deflation of depreciation or indirect taxes. Thus the only feasible approach is to produce a nominal total and apply a GDP deflator. I use the GDP deflator implicit in the official data for 1997/98 growth, which give separate growth rates for GDP in current and "comparable" (i.e. real terms) prices [derived from 1, pp. 55, 57].

WAGES

Data included in this category: wages paid to "staff and workers" (*zhigong*) in all categories, wages paid to employees of township-village (TVE) enterprises (which are not covered under payments to "staff and workers"), and other kinds of wages paid to rural residents (the last item based on survey data). Miscellaneous income receipts by urban residents (also based on survey data), some clearly from casual employment, are included in the profit category below.

Note that the total for "compensation of laborers" in [1, p. 66] - RMB 4398.9 billion - is so large that it must include the income of self-employed farmers

INTEREST

Figures in this category are based on asset totals and selection of what appear to be suitable interest rates.

I1. Interest on household bank deposits = sum of "urban and rural savings deposits" and "agricultural deposits" [*nongye cunkuan*]

Deposit total (yearend, RMB Billion)

1995	3085.8	[3, 622]	Average deposit total: (avg of yearend figures)
1996	3988.5	[3, 622]	1996 3537.2
1997	4781.2	[2, 668]	1997 4384.8
1998	5525.6	[1, 624]	1998 5153.4

Interest rate - unweighted average of rates for household deposits

Demand, 3 mo, 6 mo, 1 year	
August 1996	4.54
Oct. 1997	3.60
July 1998	3.24 [1, 627]

Assumed average interest rate for

1996	4.54%
1997	$[(10/12)*4.54] + [(2/12)*3.60] = 4.38\%$
1998	3.24%

Note: I have no detailed data on the composition of household deposits by maturity [however, see 1, p. 318 for a breakdown of household deposits between fixed and current accounts]. This procedure may underweight longer-term deposits. However the rates on these deposits fell further than the rates for short-term deposits. Re-weighting that puts greater emphasis on 2, 3, and 5 year term deposits will reduce the growth of interest income in 1997/98 and lower the estimated growth of nominal and real GDP.

Interest paid to households

1996	362.6 [1, 92]
1997	433.6
1998	377.0

The figures for 1997 and 1998 are derived from the 1996 total using changes in annual average deposit totals and average interest rates shown above. Thus the interest paid in 1997 is $362.6 * (4384.8/3537.2) * (4.38/4.54) = \text{RMB } 433.6$ billion.

[I2. Interest on non-household bank deposits **THIS CATEGORY OMITTED**

In addition to household and agricultural deposits, banks hold three further categories of deposits: enterprise deposits, treasury deposits, and deposits of government agencies and organizations.

Interest paid on enterprise deposits increases enterprise profits on a one-to-one basis. It is therefore omitted here.

Interest on other deposits is therefore based on deposit totals for treasury deposits and deposits of government agencies and organizations.

Other Deposit total (yearend, RMB Billion)			
1995	192.2	[3, 622]	Annual average deposits
1996	224.3	[3, 622]	1996 208.2 billion
1997	243.1	[2, 668]	1997 233.7
1998	347.3	[1, 624]	1998 295.2

Deposit rates (assumed): unweighted average of demand and 3 month rates for enterprise deposits

August 1996	2.66
Oct. 1997	2.30
July 1998	2.12

Assumed rate for

1996	2.66%
1997	$[(10/12)*2.66] + [(2/12)*2.30] = 2.60\%$
1998	2.12%

I3. Interest paid on government debt. Stock and flow information for government debt appears in [1, p. 284]. The source gives payments for three items: domestic debt, foreign debt, and loans from the People's Bank (PBOC - China's central bank).

Total payment on these 3 categories of debt is

1996	131.2 billion RMB.
1997	191.8
1998	235.3

Government outlay on interest is 65.9 billion in 1996 [1, p. 92]

So interest payments account for $100*65.9/131.2 = 50.2$ percent of debt service in 1996. Payments to PBOC are specifically identified as "interest"; repayment on domestic and foreign debts consists of "principal and interest." In 1996, interest payments to PBOC totaled RMB 2.80 billion [1, p. 284].

Therefore the share of interest in repayment of principal and interest for domestic and foreign debt in 1996 is $100* (65.9 - 2.80)/(131.2 - 2.80) = 49.1\%$.

I assume this ratio is valid throughout 1996-98 and applies equally to foreign and to domestic debt.

I assume that foreign debt is held entirely by overseas agents and entities. Payments linked to foreign debt therefore create no income for domestic agents and are omitted.

Interest paid on debt held by commercial banks and other domestic enterprises adds to profits on a one-for-one basis, and is therefore excluded here.

I therefore include two categories of interest payments on government debt: 1) payments to households; and 2) payments to the People's Bank of China (PBOC - China's central bank).

1) interest on government debt paid to households.

Nicholas Lardy finds that households held RMB 248 billion of government bonds in 1995 and RMB 320 billion in 1996. In each year, the face value of these bonds amounted to 6% of household financial assets. According to Lardy, "households own about three-quarters of government bonds outstanding" [10, p. 132]. I assume that households acquired three-fourths of incremental domestic debt during 1997 and 1998 (with no allowance for possible repayment of principal).

Household interest income from government bonds is therefore three-fourths of all such interest payments. I assume that interest costs amount to 49.1 percent of "payment for the principal and interest of domestic debts" shown in [1, p. 284].

[**THIS CATEGORY OMITTED 2**, interest on government debt paid to the People's Bank (PBOC). Annual figures appear in [1, p. 284].]

[14. Interest on official foreign exchange reserves THIS CATEGORY OMITTED

China's yearend foreign exchange reserves for 1996-98 were: [13, p. 67]

1996	US\$105.03 billion	average annual holdings	
1997	139.89	1997	122.46
1998	145.00	1998	142.44

I assume average earnings of 5 percent on these reserves (this is pure speculation - I have no idea what proportion of these reserves are held in income-earning assets, nor of the rate of return on such assets), and convert at the yearly rates cited in [13, p. 131]: US\$1 = RMB 8.2898 for 1997 and RMB 8.2791 for 1998.]

15. Interest paid by non-financial firms (see excel file) **this category omitted**]

TAXES

This calculation should include only indirect taxes. The table of "Government Tax Revenue" in [1, p. 268] includes five revenue categories:

- industrial and commercial tax
- tariffs
- various agricultural taxes
- income tax for state enterprises
- income tax for collective enterprises

I include the first three items and omit the two categories of income taxes.

China's central, provincial, and (especially) local governments also collect a wide variety of "extra-budgetary revenue" as well as unauthorized or informal levies. There are no precise data on the magnitude of these revenues; Chinese authors indicate that the total may approach the figures for budgetary revenues. However the vast majority are either fees for service (e.g. tolls, pollution cleanup fees) or direct taxes levied on specific enterprises. Although the extra-budgetary category includes some indirect taxes (e.g. taxes for slaughtering animals), the amounts appear to be small. I therefore omit the entire category of extra-budgetary and informal revenues from this calculation.

DEPRECIATION

Depreciation is a difficult area in China's national accounts. Asset valuations are based on exclusively on historic cost, with no allowance for economic obsolescence or for changes in the price level. Annual depreciation rates are unrealistically low [14, pp. 19-20]. I make no effort to overcome these difficulties, and rely exclusively on published Chinese figures.

The standard yearbooks give annual depreciation totals by province for both 1997 and 1998 [see 1, p. 66; 2, 66]. The yearbook compilers do not provide totals for the provincial figures. The totals seem quite large. Several provinces - Beijing, Inner Mongolia, Anhui, Shanghai, Jiangxi, Chongqing, Sichuan, and Tibet - show that depreciation increased by more than 20 percent during 1997/98. These figures seem improbably high (unless there was a big increase in depreciation rates of which I am unaware). I therefore fall back on a partial total based on sectoral figures for fixed assets and sectoral depreciation rates.

PROFIT

The standard yearbooks present provincial data for 1997 and 1998 that include a category labeled "operating surplus" (*yingye yiyu*) The sum of provincial data, which is not provided by the yearbook compilers, rises by 0.47 percent between 1997 and 1998 [1, p. 66; 2, p. 66]. Lacking a clear explanation of these data, I revert to (sometimes partial) data for the following components of profit:

- profit of formally organized business enterprises

- net income from household businesses operated by rural residents
- miscellaneous income of urban residents

Sources for profit data of formally organized business enterprises:

Industry: [2, 447; 1, 435]
 TVE enterprises: [2, 422; 1, 413]
 Construction: [2, 519; 1, 458]
 Railways: [1, 519]
 Banking [see below]
 Trust companies and securities firms [see below]
 Insurance [see below]
 Airlines [see below]
 Trade: [2, 605; 1, 566]
 Catering [2, 606; 1, 567]

The profit information for industry is confusing. The sources provide different types of information in different years (they also cover a changing array of enterprises - we ignore this complication - all references are to tables that relate to independent accounting units at and above the township level - however the data for 1998 are exclude enterprises outside the state sector that do not reach a certain level of sales revenue):

	P1 Total Profit	P2 Profit &Tax	P3 Pretax Profit	P4 Aftertax Profit	Source	Contains Data for
Industry 98	x	x			[5, p. 81]	1997
Yearbook 99	x				[1, p. 435]	1998
Yearbook 98	x		x		[2, p. 447]	1997
Yearbook 97	x		x		[3, p. 433]	1996
Yearbook 96			x	x	[4, p. 413]	1995

The English column heads are shown above.

The Chinese terminology is:

Total profit = *lirun zong'e*
 After tax profit = *lirun zong'e*
 Profit & Tax = *lishui zong'e*
 Pretax Profit = *lishui zong'e*

Note that two English terms: "total profit" and "after tax profit" correspond to a single Chinese phrase, as do the English terms "Profit & Tax" and "Pretax Profit."

A further complication is that the Chinese data appear to distinguish between different types of taxes. It is my (possibly mistaken) impression that the terms "pre-tax profit" and "total profit" (i.e. *lirun zong'e* in Chinese) both refer to a profit total **after** deduction of indirect taxes, but **before** payment of income taxes. If this is correct, then the figures for *lirun zong'e*, which are net of indirect taxes but inclusive of sums paid as direct (i.e. income) taxes, are the appropriate profit totals for this analysis. These are the figures that I have used.

Banking: 1997 pre-tax profit data for 20 financial institutions, including the four major state-owned commercial banks, appear in the 1998 finance yearbook [6, Pp. 570-79]. The combined 1997 profit total for these firms is RMB30.11 billion.

I do not have a copy of the 1999 finance yearbook, which presumably contains comparable 1998 profit figures for these banks. I therefore rely on 1998 profit data for two of China's four largest banks:

China Construction Bank (CCB), one of the four large state-owned commercial banks. CCB profits for 1998 and 1999 were RMB 2.2 billion and RMB 7.3 billion respectively [7, p. 5]. Earnings at CCB rose from RMB 1.88 in 1997 [6, p. 573] to RMB 2.2 billion during 1997/98, an increase of 17.0 percent.

Industrial and Commercial Bank of China [ICBC]. Earnings rose from RMB 3.05 billion in 1997 [6, p. 571] to RMB 3.39 and RMB 3.94 billion in 1998 and 1999 [20, p. 5].

Combined earnings for the two big banks were therefore RMB 5.27 billion in 1997 and RMB 5.59 billion in 1998, an increase of 6.1 percent.

I apply this figure to the entire banking sector. Estimated 1998 banking profit is therefore $30.11 * 1.061 = \text{RMB } 31.95$ billion.

Trust companies and securities firms: the 1998 finance yearbook also provides pre-tax profit figures for 11 trust companies and 4 securities firms. The combined profit totals are RMB 13.53 billion and RMB 2.12 billion respectively. I apply the 6.1% profit increase recorded for CBC to both sectors.

Total profit for trust companies and security firms therefore becomes

$$1997 \quad 13.53 + 2.12 = 15.65 \text{ billion}$$

$$1998 \quad 15.65 * 1.061 = 16.60$$

Insurance: 1997 pre-tax profit data for 8 insurance companies appear in [6, pp. 628-634]. Combined total profit for 1997 is RMB 3.04 billion, of which RMB 2.06 billion was earned by People's Insurance Company of China (PICC), China's largest property insurer. PICC profits for 1998 and 1999 were RMB 0.658 billion and RMB 1.4 billion respectively [8, p. 5]. Earnings at PICC declined from RMB 2.06 billion to RMB 0.658 billion during 1997/98, a drop of 68.1 percent. I apply this figure to the entire insurance

sector. Total profit for the insurance industry is therefore $3.04 * 0.319 =$ RMB 0.97 billion.

Airlines. Enterprises in civil aviation earned "profit from their main business" (*zhuying yewu lirun*) of RMB 8.31 billion in 1996 and RMB 2.15 billion in 1997 [17, p. 619].

The 1999 annual statistical communique included civil aviation in a list of sectors that had "turned losses into profit" during 1999 [*Renmin ribao* [People's Daily], 29 February 2000, p. 2, extracted from web site www.peopledaily.com.cn].

Lacking specific detail, I record profits of RMB 2.15 billion for 1997 and zero for 1998.

For further information about airline profits, see below.

Omitted sectors:

Post and Telecommunications: revenue and cost totals for "postal and telecommunications enterprises" appear in [2, p. 573]. The balance of revenue and expenditures from "business operations" [*yewu shouzhichae*] during 1997 was RMB 12.22 billion. Time series data showing separate revenue figures (but no expenditure totals) for post and for telecommunications appear in [1, p. 531]. Earnings by telecommunications companies in 1999 amounted to RMB 243.3 billion, an increase of 24.1 percent over 1998 [9, p. 1], which becomes $243.3/1.241 =$ RMB 196.05 billion. Unfortunately the 1997 figures provide no separate subtotals for telecommunications.

Highway and waterway transportation. Profit data for 1997 operations of "highway, waterway and port enterprises with independent accounting" and revenue and cost totals for "postal and telecommunications enterprises" appear in [2, p. 567]. I have found no comparable data for 1998.

Airline transportation: Enterprises in civil aviation earned "profit from their main business" (*zhuying yewu lirun*) of RMB 8.31 billion in 1996 and RMB 2.15 billion in 1997 [17, p. 619]. **THIS SECTOR NOW INCLUDED IN PROFIT TOTALS.**

1998 was a difficult year for China's airlines. Excess capacity sparked big discounts on air tickets. In February 1999, government authorities ordered a stop to discounting in order to stem losses, which amounted to RMB 970 million during the first half of 1998 [12, p. 2]. In April 1999, civil aviation authorities announced schedule cutbacks because "the 15 companies involved recorded a low passenger occupancy rate" in 1998. The same report indicated that "the seat occupancy rate on domestic airlines dipped by 2.7 percentage points to stand at 53 percent" in the first quarter of 1999, implying seat occupancy of 55.7 percent in the fourth quarter of 1998. The April 1999 report also noted that "all but four of China's major airline companies lost money" in 1998 [19, p. 2].

In January 2000, Liu Jianfeng, China's Minister of Civil Aviation Administration, stated that allowing "discount competition now would destroy the market" [11, p. 3].

A report published in August 1999 described the civil aviation sector as "a chronic money-loser" that "appears to have seen the light at the end of the tunnel in the fight to achieve industry-wide profit in 1999" [12, p. 2]. According to *China Daily*, airline profits amounted to RMB79.7 billion in 1999, an increase of 10.2 percent over 1998 [11, p. 3], which would then become $79.7/1.102 = \text{RMB } 72.3$ billion. The airlines earned an "astounding" profit of RMB 262 million in January-July 1999 [12, p. 2].

Under these circumstances, I conclude that the profit series implied by the data from these sources, namely:

1996	8.3 billion RMB
1997	2.3
1998	72.3
1999	79.7

cannot represent a consistent account of earnings from China's airline industry. The implied 30-fold profit leap for 1997/98 is not consistent with other information about "lacklustre" demand [19, p. 2], widespread price discounting, extensive losses, and low seat occupancy. Pending clarification, I omit this sector from the GDP calculation

HOUSING

Until the recent housing reform, most urban housing was provided by employers at rents that covered only a fraction of building and maintenance costs. Rural housing is for the most part built and maintained by owner-occupants. As a result, we have no good source of information on the contribution of housing services to aggregate output. Indeed, World Bank analysts, writing in 1992, pointed to "improving accuracy in both the scope and valuation of housing services" as "possibly the most significant single task facing Chinese statisticians."

International practice calls for the inclusion in total output of "imputed rents" that approximate the market value of owner-occupied housing. I am not aware that China's current national income accounts include such adjustments.

What follows is a crude effort to produce plausible figures for depreciation and imputed rental of housing. The calculation is as follows:

- 1) use 1997 and 1998 survey data for net housing area per person (square meters) in rural and urban locations. [1, p. 349]
- 2) multiply by urban and rural populations [1, p. 21] to obtain 1997 and 1998 housing floor space in urban and rural areas.

- 3) assume the typical component of the housing stock was built in 1987 (this is pure speculation); thus multiply by average construction cost for housing built in 1987: RMB 213 per square meter in urban areas [15, p. 235 - this figure is for housing built under the rubric of "basic construction"]; and RMB 56.97 per square meter of privately built rural housing [16, p. 289 - quotient of total outlay and square meters built in 1987].
- 4) Multiply the derived value of rural housing by 0.12 and the derived value of urban housing by 0.08 (both figures based on pure speculation) to account for the value of housing services (0.08 * average original cost for both urban and rural components) and depreciation (0.04 * average original cost for the rural component only - because depreciation for urban housing should be included in the separate calculation of depreciation for industry etc.)

CONCEPTUAL PROBLEMS

1) Treatment of interest payments in these calculations is not consistent. I have excluded interest paid on enterprise bank deposits and on government bonds held by enterprises and commercial banks. Aside from data problems, the reason for this omission is that such payments increase profits on a one-for-one basis. Their inclusion would therefore appear to constitute double counting unless we have a separate measure of profits that excludes income from financial assets.

At the same time, the calculation includes interest paid to banks by non-financial enterprises (item I-5). But the same logic would suggest exclusion of this item - any increase in interest repayments translates into an identical increase in bank profits.

2) Valuation of housing. My attempt to produce estimates for imputed rental (urban and rural) and depreciation (rural only) values both components of the housing stock by multiplying estimated net floor space by average urban and rural construction cost (per square meter) for 1987. The underlying assumption that the average housing unit was constructed in 1987 is not implausible. However this procedure neglects the considerable increase in housing prices since 1987. Depreciation is based exclusively on (estimated) historic construction cost.

OMISSIONS

Omitted categories [+ /-/0 indicates likely impact of inclusion on estimated GDP growth for 1997/98]

1. Rent (cash payments) [0]
2. Property income other than interest or rent (e.g. dividends) [+]
3. Profit of companies in some service industries - e.g. airlines, telecommunications, shipping [0?]

4. Depreciation for some sectors [+]

Comment on omitted categories:

1. "Rent on land use" is an empty line in the flow of funds table [1, p. 92]. The (heavily subsidized) rents for urban housing owned by the state or by work units are omitted here. Instead, I have included an estimate of imputed rental for occupancy of both urban and rural housing. I have found no information about non-residential rental payments, which are therefore excluded.
2. Property income other than interest or rent. The flow-of-funds tables include a small item for dividends (less than 1/10 of interest income; also smaller than income tax payments), most of which appear to be remitted to overseas recipients (presumably associated with foreign-invested firms). A possibly more significant omission is income streams arising from informal credit transactions, about which there is no information.
4. Profit of companies in the service sector. Omitted categories include:
 - telecommunications [profits probably rose rapidly in 1997/98]
 - airlines [probable profit decrease due to excess capacity and price discounting]
 - shipping [probable decrease due to sluggish traffic volume]
5. Depreciation for some sectors. Inclusion would probably push the GDP totals upward by a small amount.

Net outcome of these omissions is difficult to predict. My guess is that inclusion of omitted items would most probably increase estimated 1997/98 GDP growth by a small amount. However these omitted items are both small and diverse, and therefore unlikely to have any substantial impact on the total.

Bias of GDP Calculation

It is difficult to predict the impact of adding omitted elements on the estimated GDP total. As noted, I would guess that inclusion of omitted items, if possible, might fractionally increase estimated GDP growth for 1997/98.

There are, however, elements within the calculations that suggest an upward bias in the present results. I can identify three possible sources of upward bias, which are discussed in order of increasing potential importance:

- 1) The procedure used to estimate interest income from household deposits probably understates the importance of time deposits with terms of 2-5 years. Interest rates on such deposits fell faster (in percentage terms) during 1996/98 than rates for deposits with

shorter maturities. Complete information on the term structure of household deposits would probably lead to a small downward revision of the (already negative) growth of interest paid to households during 1997/98.

2) The present GDP estimates make considerable use of urban and rural survey data carried out by the National Bureau of Statistics. Results of these surveys are included in the estimation of business and (non-TVE) wage income for rural households, miscellaneous income of urban residents (five categories summarized in line P3 of the excel file), and the 1997/98 increase in per capita housing space for both urban and rural residents. Many Chinese authors have decried the "winds of falsification" and the extraordinary pressures that impacted China's statistical professionals in 1998. Former NBS Director Zhang Sai, for instance, wrote that "the challenge of keeping statistics accurate was particularly difficult" in 1998 [18]. While allegations of malfeasance have focused on individual work units and especially on local and provincial governments, it is also possible that the operations of NBS itself were also affected.

3) Possible overstatement of tax revenues. Informants familiar with the tax system indicate that overstatement of revenue growth is a distinct possibility, particularly since revenue targets were identified as "political responsibilities" in 1998 (and also in 1999). Revenue reports are based on the cash balance in specific revenue accounts on the reporting dates. It is apparently possible to temporarily transfer funds into these accounts, thus artificially inflating balances on the reporting dates. One knowledgeable observer suggested that as much as one-fourth of the reported increase in tax revenues during 1998/99 might be artificial.

The greatest possibility of upward bias appears in the tax data. If one-fourth of the reported increase in indirect tax collections for 1997/98 represented false reporting (*shuifen*), our estimates of nominal and real GDP growth for 1997/98 would each drop by 0.8 percentage points to 1.7% (nominal) and 2.8% (real) growth. This change seems much larger than any upward revision that might arise from correction of omissions.

The probability of substantial distortion of 1998 tax receipts seems considerable. There is also the possibility of politically-inspired distortion of 1998 survey results. In my judgment, the likelihood and scale of possible downward revisions outweighs possible upward revisions arising from the conceptual problems and omissions discussed above. Unless my calculations have omitted important items not mentioned here that could impart a large downward bias to the outcome, I would argue that, if anything, the results shown here are likely to overstate actual growth during 1997/98.

Sources

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