Chapter 3

Research Methodology

3.1 Introduction to the SimFin model:

This study adopted and little modified the SimFin model (Carrin 1998), according to the availability of Chinese data[1]. SimFin focuses on government' s behavior with regard to the budgets for publicly provided health services. Budgeting will be seen as a part of the planning process. In a planing process, it starts from the present situation and indicate the objectives one wishes to achieve within a given period as well as ways in which that is to be achieved.

For the health policy-maker, planning means that they are able to propose, for the coming years, how the government's health policy and expenditure on health should develop. These proposals, which will subsequently need to be ratified by the government bodies, in particular through a national plan, will be the outcome of a comparison between the budgetary possibilities on the one hand and the financial needs of the health sector on the other hand.
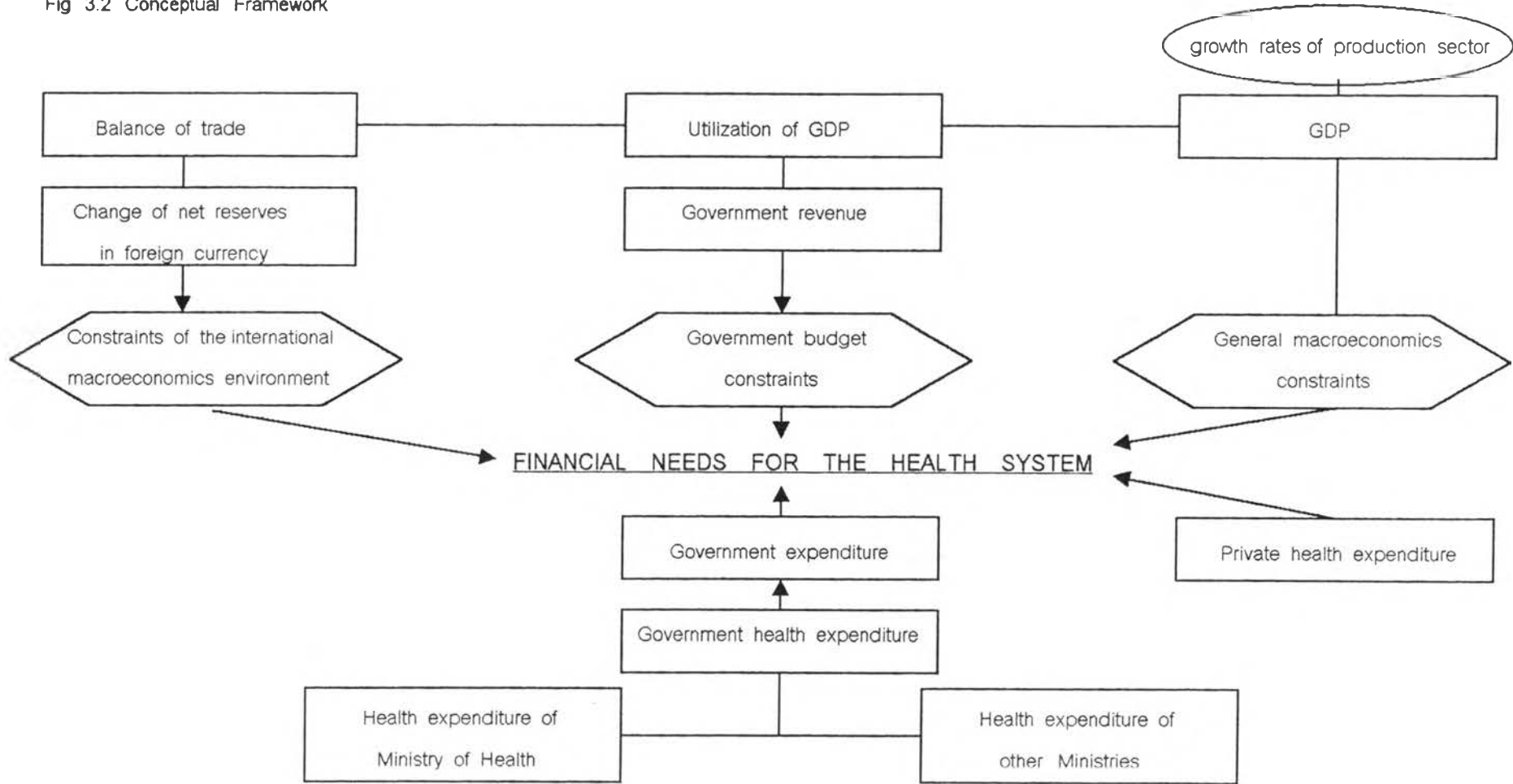

The budgetary possibilities are normally relied on the resources constraints. These constraints are determined in part by national economic activities as well as by the international environment. They also depend on the choices made by the government (with regard to the role of health in the government budget). This analysis of budgetary possibilities can then be called a "macro" approach and is facilitated by Simfin's macro submodel called MacroFin, proposed by Carrin(1998).

3.2 The conceptual framework

Output (or revenue) of the economy derived from international trade (external factors) and domestic production (GDP) with the utilization of GDP are used to determine financial constraints and needs. Health expenditure as a component of total expenditure is then taken into account in the model. Private health expenditure is also included. (Fig 3.2)

Fig 3.2 Conceptual Framework

growth rates of production sector

| Balance of trade | Utilization of GDP | GDP |

Change of net reserves in foreign currency

Government revenue

Constraints of the international macroeconomics environment

Government budget constraints

General macroeconomics constraints

FINANCIAL NEEDS FOR THE HEALTH SYSTEM

Government expenditure

Private health expenditure

Government health expenditure

Health expenditure of Ministry of Health

Health expenditure of other Ministries

Source: SimFin: a simulation model of financial needs and government budget options for the functioning of the health system / WHO 1998

3.3 The Model Feature

3.3.1 Use of Macro Fin begins with the defined base year. This study chose the year 1995 to be the given initial year owing to the available data. By adding the forecast period of ten years to the selected year, the forecasts of each year will be obtained. The detailed structure of Macro Fin consists of the following sets of equations:

1). The population:

The population(POP) each year is obtained simply by taking the population level for the previous year and multiplying it by the demographic growth rate[2](grpop):

$$POP_t = POP_{t-1} * (1 + grpop_t)$$

The value is used in order to obtain values of variables expressed in per capita terms.

2). Value added by sector[3]:

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[2] All growth rate are represented by symbols beginning with "gr". The subscript "t" means years.

[3] Symbols for variables in lower case refer to variables (except growth rate) in constant prices. The same symbols in upper case refer to variables in current prices.

2.1) Value added (va) may be regarded as the net contribution of a sector to a nation's production. There are composed of three sectors in this study: (a) Primary Industry (Agriculture); (b) Secondary Industry (Industry); (c) Tertiary Industry (Services). The value added in these sectors ($j=1$ to 3) in time t is determined by taking into account the value of the previous year (t-1) at constant prices and the rate of growth (grva):

$$va_{t,j} = va_{t-1,j} * (1 + grva_{t,j})$$

2.2) The gross domestic product is the best measure of economic activity in a country. Gross domestic product at factor cost (gdpf) measured in constant prices is then the sum of added values from the various sectors:

$$gdpf_t = \Sigma j \, va_{t,j}$$

Gross domestic product in current prices is obtained by multiplying gdp by gdp deflator (PRPGDP):

$$GDPF_t = gdpf_t * PRPGDP_t$$

3). Utilization of resources:

The values of the different utilization of gross domestic product at current factor prices (GDPF) are given for the base year. These are private consumption (PVC), government consumption (GVC), gross fixed capital formation (GFC), import of goods and services (MGS), export of goods and services (EGS). The model then calculates what share of gross

domestic product for the base year these utilization represent. Those shares take the form of coefficients. The following equations are to obtain the information on the utilization of resources:

$$PVC_t = a_{t,2} \ * \ GDPF_t$$
$$GVC_t = b_{t,2} \ * \ GDPF_t$$
$$GFC_t = c_{t,2} \ * \ GDPF_t$$
$$EGS_t = d_{t,2} \ * \ GDPF_t$$
$$MGS_t = e_{t,2} \ * \ GDPF_t$$

4). International transactions:

    4.1) All elements needed obtained from the above section will then be used to calculate the balance of trade (BOT_t): export of goods and services minus import of goods and services equate to the balance of trade.

$$BOT_t = EGS_t - MGS_t$$

    4.2) The other components of international transactions are net foreign income (NFIN), net foreign transfers (NFTR), and short- and long-term capital flows (CF). The value of a transaction in year t is obtained by applying the rate of growth to year t-1:

$$NFIN_t = NFIN_{t-1} \ * \ (1 + grnfin_t)$$
$$NFTR_t = NFTR_{t-1} \ * \ (1 + grnftr_t)$$
$$CF_t = CF_{t-1} \ * \ (1 + grcf_t)$$

4.3) The change of net reserves in foreign currencies (RESV) is defined as:

$$RESV_t = BOT_t + NFIN_t + NFTR_t + CF_t$$

Which is written in terms of US$ as:

$$RESV\$_t = RESV_t / ER_t$$

The balance of trade and the change in net foreign currency reserves will be a result of the model. These two variables show the international position of the economy. A negative balance of trade continuing for several years, for example, could explain a drop in net reserves. Such net reserves could hinder the desired purchase of imported goods such as drugs by the health sector. On the contrary, a positive balance of trade may help to increase reserves, and this could allow the purchase of drugs to be stepped up.

5). Prices:

All price indexes for the base year are fixed at 100. For the forecasting period, the consumer price index (CPI) and the GDP deflator (PRPGDP) are defined as follows:

$$CPI_t = CPI_{t-1} * (1 + grcpi_t)$$

$$PRPGDP_t = PRPGDP_{t-1} * (1 + grprpgdp_t)$$

The consumer price index is used to convert current expenditure (such as that incurred by the government or by the private sector) at constant price to current expenditure at current prices. The consumer price

index is used to convert capital expenditure at constant price into capital expenditure at current prices. The GDP deflator is used to calculate the gross domestic product at current prices.

6). Exchange Rate:

This study, owing to the limitation of data, will use nominal exchange rate (ER, Yuan/US$). The exchange rate is used to convert foreign currency values into values expressed in local currency or convert local currency values into values expressed in foreign currency.

7). Government revenue:

7.1) Three kinds of tax are identified, one is "industry, commercial, agriculture and Animal Husbandry"(TXIC), second is "others"(TXO), third is "international trade"(TXFT). The levels of these taxes are given for the base year. Estimates are then made for the forecasting period with the following equations:

$$TXO_t = b_{t,3} * (PVC_t + GVC_t)$$

$$TXFT_t = c_{t,3} * (EGS_t + MGS_t)$$

The TXIC are linked to the gross domestic product:

$$TXIC_t = a_{t,3} * GDPF_t$$

For the base year, the coefficients above are calculated. However, some hypotheses about the rates for the forecasting period may also be made as given.

7.2) Other government revenue: non-tax revenue(NTR) can be calculated in the similar manner,

$$ntr_t = ntr_{t-1} * (1 + grntr_t)$$

7.3) The values of government revenue at current prices is calculated by multiplication of other government revenue by the GDP deflator:

$$NTR_t = ntr_t * PRPGDP_t$$

7.4) Total government revenue (GREV) can now be calculated:

$$GREV_t = TXIC_t + TXFT_t + TXO + NTR_t$$

8). Government expenditure:

8.1) Expenditure at constant prices:

In this study, according to the available data, current expenditure includes Economic Construction(gec), Culture & Education and Administration(gca), National Defense(gnd) and Repayment of Loans & others(gro). The values of such expenditure for the base year must be given. Expenditure for the simulation period is then calculated with the following equations:

$$gec_t = gec_{t-1} * (1 + grgec_t)$$
$$gca_t = gca_{t-1} * (1 + grgca_t)$$
$$gnd_t = gnd_{t-1} * (1 + grgnd_t)$$
$$gro_t = gro_{t-1} * (1 + grgro_t)$$

8.2) Expenditure at current prices:

Expenditure at current prices is obtained by multiplying expenditure at constant prices by the consumer price index:

$$GEC_t = gec_t * CPI_t$$

$$GCA_t = gca_t * CPI_t$$

$$GND_t = gnd_t * CPI_t$$

$$GRO_t = gro_t * CPI_t$$

Total government expenditure (GE) is then determined as follows:

$$GE_t = GEC_t + GCA_t + GND_t + GRO_t$$

8.3) The government budget deficit:

The government budget deficit (GBD) is defined as follows:

$$GBD_t = GREV_t - GE_t$$

And as a percentage of GDP at factor cost:

$$PGBD_t = GBD_t / GDPF_t$$

9). Ministry of health expenditure:

9.1) Expenditure at constant prices:

(a) In this study, the expenditure is classified as:

1. Recurrent budget for health system;

2. Medical research;

3. Health administration expenditure;

4. Other health expenditure.

(b). The values of the base year are given. For the simulation period, the current expenditure of the MOH($hre_{mi,j}$) of category j (j=1,...,4) in year t is the result of multiplication of the value of year t-1 by the rate of growth ($grhre_{mi,j}$):

$$hre_{t,mi,j} = hre_{t-1,mi,j} * (1+ grhre_{t,mi,j})$$

Total current expenditure therefore equals the the sum of the values of 4 categories:

$$hre_{t,mi} = \Sigma_j \ hre_{t-1,mi,j} * (1+ grhre_{t,mi,j})$$

(c). Health capital expenditure (hce) is determined as follows:

$$hce_{t,mi} = hce_{t-1,mi} * (1+ grhce_{t,mi})$$

(d). Total expenditure (he) is calculated as follows:

$$he_{t,mi} = hre_{t,mi} + hce_{t,mi}$$

9.2) Expenditure at current prices:

(a). To obtain expenditure at current prices, the consumer price index was used:

$$HRE_{t,mi,j} = hre_{t,mi,j} * CPI_t$$

Total current expenditure :

$$HRE_{t,mi} = \Sigma_j \ HRE_{t,mi,j}$$

(b). Capital expenditure at current prices(HCE) is obtained by using the consumer price index. This leads to the following equations:

$$HCE_{t,mi} = hce_{t,mi} * CPI_t$$

(c). Total expenditure by the Ministry of Public Health:

$$HE_{t,mi} = HRE_{t,mi} + HCE_{t,mi}$$

10). Health expenditure by other ministries:

The MOH is not only one to incur health expenses. Other Ministries can also engage in the health services. The other Ministries in the study refer to the Ministry of Finance, the Ministry of Defense, the Ministry of Education, Ministry of Labor, and Other special Ministry etc..

10.1) health expenditure at constant prices:

Four categories are chosen:

1. Recurrent budget for Traditional medicine and family planning;

2. Government employee insurance scheme and Enterprises health expenditure (state-owned);

3. Collective-owned units and organization & Institutions health expenditure;

4. Other government department health expenditure(special) and high education for medical training.

Current expenditure (hre) and capital expenditure (hce) are defined as follows:

$$hre_{t,oth,j} = hre_{t-1,oth,j} * (1 + grhre_{t,oth,j})$$

$$hce_{t,oth,j} = hce_{t-1,oth,j} * (1 + grhce_{t,oth,j})$$

where $j(j=1,...,4)$ refers to the category.

Total expenditure is therefore defined as:

$$he_{t,oth} = \sum_j hre_{t,oth,j} + \sum_j hce_{t,oth,j}$$

10.2) Health expenditure at current prices:

For current expenditure at current prices (HRE) and capital expenditure at current prices (HCE), the CPI is used to convert them from the constant prices terms:

$$HRE_{t,oth,j} = hre_{t,oth,j} * CPI_t$$

$$HCE_{t,oth,j} = hce_{t,oth,j} * CPI_t$$

Total expenditure of all the other ministries is obtained by summing all types:

$$HE_{t,oth} = \sum_j HRE_{t,oth,j} + \sum_j HCE_{t,oth,j}$$

11). Health expenditure in the private sector:

11.1) Expenditure at constant prices:

In China, there are three types of private health expenditure:

1. Urban households;

2. Rural households;

3. Private practitioners expenditure.

Current expenditure (hre) and capital expenditure (hce) are defined as:

$$hre_{t,pr,j} = hre_{t-1,pr,j} * (1 + grhre_{t,pr,j})$$

$$hce_{t,pr,j} = hce_{t-1,pr,j} * (1 + grhce_{t,pr,j})$$

where j(j=1,...,3) refers to the source of private expenditure.

Total expenditure is defined as follows:

$$he_{t,pr} = \sum_j hre_{t,pr,j} + \sum_j hce_{t,pr,j}$$

11.2) Expenditure at current prices:

For current expenditure at current prices (HRE) and capital expenditure at current prices (HCE), again the CPI is used to convert them from the constant prices:

$$HRE_{t,pr,j} = hre_{t,pr,j} * CPI_t$$

$$HCE_{t,pr,j} = hce_{t,pr,j} * CPI_t$$

Total private expenditure is defined as follows:

$$HE_{t,pr} = \sum_j HRE_{t,pr,j} + \sum_j HCE_{t,pr,j}$$

3.3.2 Concluding table of variables used

There are two kinds of Variables being used in this study:

1). Variable List of data to be collected (the base year):

VARIABLE	SYMBOL
Population	POP
Value added by sector j(j=1, 2, 3) (j= Primary Industry, Secondary Industry, Tertiary Industry)	Va_j
Utilization of resources Private consumption Public consumption Fixed capital gross formation Imports of goods and services Exports of goods and services	 CVP GVC GFC MGS EGS
International transactions Balance of trade Net foreign income Net foreign transfers Short - and long - term capital flow The change of net reserves	 BOT NFIN NFTR CF RESV

The exchange rate	ER
Price index Consumer Price Index GDP deflator	 CPI PRPGDP
Government revenue Industry, commercial, agriculture and animal husbandry Taxation of International trade Taxation on Others Non --Tax revenue Total government revenue	 TXIC TXFT TXO ntr GREV
Government expenditure 1. Economic construction 2. Culture & education and Administration 3. National Defense 4. Repayment of loans & others Total government expenditure Government budget deficit	 gec gca gnd gro GE GBD
Ministry of health expenditure Current expenditure by category j (j = 1,...,4):	 $hre_{mt,j}$

(j = Recurrent budget for health system; Medical research; Health administration expenditure; Others health expenditure)	
Total current expenditure	hre_{mi}
Capital expenditure	hce_{mi}
Total expenditure	he_{mi}
Health Expenditure by other ministries	
Current expenditure	hre_{oth}
Capital expenditure	hce_{oth}
Total expenditure	he_{oth}
Health expenditure in the Private sector	
Current expenditure	hre_{pr}
Capital expenditure	hce_{pr}
Total expenditure	he_{pr}

2). Variable list of data input for exogenous and policy:

VARIABLE	SYMBOL
Rate of growth of the Population	grpop
Rate of growth of Value added by sector j(j=1, 2, 3) (j= Primary Industry, Secondary Industry, Tertiary Industry)	$grva_j$

The following resources as proportion of GDP
 	
The contribution to GDP of:
 	
    Private consumption
    Public consumption
    Fixed capital gross formation
    Imports of goods and services
    Exports of goods and services
	
	a_2
	b_2
	c_2
	d_2
	e_2

Rates of growth of international transactions Net foreign income Net foreign transfers Short - and long - term capital flow	 grnfin grnftr grcf
Rate of growth of price indexes: Consumer price index Deflator of GDP	 grcpi grprpgdp
Exchange rate	

the user supplies the figures for the exchange rate	ER
Government revenue Rate of taxation on: Industry, commercial, agriculture and animal husbandry Taxation of International trade Taxation on Others Rate of growth of: Non - tax revenue (constant prices)	 a_3 c_3 b_3 grntr
Rate of growth of government expenditure (constant prices) 1. Economic construction 2. Culture & education and Administration 3. National Defense 4. Repayment of loans & others	 grgec grgca grgnd grgro
Rate of growth of Ministry of health expenditure (constant prices) Current expenditure by category j (j = 1,...,4): (*j = = Recurrent budget for health system; Medical research; Health administration expenditure;	 $grhre_{mi,j}$

Others health expenditure)	
Capital expenditure	$grhce_{mi}$
Rate of growth of Health Expenditure by other ministries (constant prices)	
Current expenditure	$grhre_{oth}$
Capital expenditure	$grhce_{oth}$
Rate of growth of health expenditure in the Private sector (constant prices)	
Current expenditure	$grhre_{pr}$
Capital expenditure	$grhce_{pr}$