

# Monitoring the Fiscal Health of Taiwan's Local Government: Application of the 10-Point Scale of Fiscal Distress

Yuan-Hong Ho, Chiung-Ju Huang

**Abstract**—This article presents a monitoring indicators system that predicts whether a local government in Taiwan is heading for fiscal distress and identifies a suitable fiscal policy that would allow the local government to achieve fiscal balance in the long run. This system is relevant to stockholders' interest, simple for national audit bodies to use, and provides an early warning of fiscal distress that allows preventative action to be taken.

**Keywords**—Fiscal distress, fiscal health, monitoring signals, 10-point scale.

## I. INTRODUCTION

THE fiscal health of local governments is important as it is an indication of the ability of local governments to meet its financial and service obligations. Fiscal health may not be the ultimate measure of success for local governments, but without a healthy financial condition, the level and quality of public services will suffer. Additionally, there are many disparate factors affecting the fiscal health of local governments. Local governments generally benefit from a booming national economy. More specifically, in addition to the general economic performance, demographic factors, nature disasters, central and local elections factors, local administrative efficiency, as well as the effective local legislative checks and balances, all affect the fiscal health of a local government.

There are some commonly used terms found in the fiscal health literature that describe the fiscal health of local government. Fiscal stress, fiscal strain, fiscal crisis, fiscal health, fiscal distress, financial condition, and financial position, are all used and have different meanings attached to them. Ladd and Yinger [1] define fiscal health as the underlying or structural ability to deliver public services to its residents, independent of the budgetary decision made by city officers. They further explain that local health is the difference between revenue-raising capacity and expenditure need, expressed as a revenue-raising capacity and expenditure need, expressed as a percentage of capacity. Clark and Appleton [2] define fiscal strain as an institutional lack of adaption to a changing environment. Meanwhile, Berry's [3] definition of fiscal health describes the extent to which a government's financial resources exceed its spending obligations.

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According to Lin and Raman [4], local government's fiscal health is related to its financial condition, which they describe as having to do primarily with fiscal effort for the relative level of taxation and spending. They point out that a government could be in good financial position but in poor financial condition. In their study, a poor financial condition meant that local governments are less likely to sustain the current level of service at acceptable levels of taxation. Groves et al. [5] state that a local government's financial condition is the result of a number of very diverse factors and can be measured by looking at cash solvency, budgetary solvency, long-run solvency and service level solvency. Kloha et al. [6] define fiscal distress in terms of whether a local government is sufficiently meeting the needs of its community. Badu and Li [7] define fiscal stress as the imbalance between the revenue raising capacity and expenditure needs of a local government. Badu and Li's definition is very much associated with the concept of tax effort, which shows the ratio of actual yield to that obtained by the standard tax system.

The variety of definitions around fiscal health has inevitably led to the development of a diverse amount of mechanisms for measuring or predicting local government's fiscal health. Brown [8] provides a concise and easy-to-use 10-point test of financial condition, where he suggests that 10 ratio measures be computed, equally weighted, and aggregated to provide an overall picture of a government's financial condition. Kleine et al. [9] discuss some of the limitations of Brown's test, and developed a more simplified 10-point scales of fiscal distress index based on nine variables to assess the performance of local government. Kloha et al. [6] applied the model to predict local fiscal stress in a sample of Michigan local governments. They found that the 10 point scale of fiscal distress appears to perform considerably better than Brown's 10 point test and provides function as an early warning system of fiscal difficulties.

Hendrick [10] presents a theoretic framework for assessing local government fiscal health based on dimensions of properties of government's environment, balance of fiscal structures with environment, properties of the government's fiscal structure, and population and institutional factors. Hendrick points out that the dimensions are related but often in indirect or nonlinear ways, and hence must be measured separately rather than combined into a comprehensive indicator of fiscal health.

Wang et al. [11] define financial condition as the level of financial solvency. They develop and test a measure of

financial condition for state governments. The measure includes the dimensions of cash solvency, budget solvency, long term solvency, and service levels solvency, and eleven indicators. Their findings show that the measure they used is relatively reliable and valid.

Krueathep [12] uses the Ladd and Yinger's [1] procedure for calculating fiscal health index and expenditure need and Martinez-Vazquez et al.'s [13] regression based revenue-raising capacity measure for predicting amount of revenue, to analyze the fiscal health of fourteen municipalities' fiscal condition in Thailand. The results show that municipalities in the large central cities and in the semi-rural based areas tend to have financial difficulties in meeting their service obligation, as compared to the suburbs and industry based cities.

Raju [14] employs the deficit indicators approach in the Hakkio-Rush [15] framework to assess fiscal health on sustainability of State-level finances in India. Cohen et al. [16] utilizes six measures, including the ratio of total liabilities to total assets, ratio of own revenues to total liabilities, ratio of short term liabilities to own revenues, ratio of operating expense to own revenues, ratio of subsidies to population, and ratio of own revenues to population, and combines a simulation analysis approach (stochastic multi-criteria acceptability analysis) to evaluate the financial viability of local governments in Greece.

As mentioned above, scholars have provided several techniques to measure different governments' fiscal health. It is difficult to argue that one particular indicator (or one set of indicators) is the best sign of fiscal health without knowing the intended purpose, the target audience, the practical constraints on the analysis, and the availability of account information. Thus, there is a pressing need for similar case studies on different countries. This study is designed to add to the existing body of work, by developing a monitoring system to determine whether a local government in Taiwan is at risk of fiscal health.

Local governments in Taiwan have experienced a healthy fiscal status for an extended period of time. However, due to economic development purposes, Taiwan's central government had launched a series of tax relief policies during the last decade, leading to gradually deteriorating financial conditions. In order to achieve the goal of supporting economic growth by taxation while fostering an increase of tax revenues by economic growth, the Taiwan government needs to make policies that consist of and enhance both "economic growth" and "fiscal sustainability".

In this study, we first compute the fiscal health indicators for 21 local governments in Taiwan over the 1984 to 2010 period, based on existing work of Kleine et al. [9]. We then develop an early warning system to monitor whether a local government is at risk of fiscal distress and at the same time we identify a suitable fiscal policy for the local government to achieve fiscal balance in the long run. This paper is organized as follows: Section two describes the data used in this study and our methodology, section three discusses study results, and section four presents our conclusions.

## II. DATA AND METHODOLOGY

The 10-point scale of fiscal distress is a composite of nine budgetary and socioeconomic indicators capable of measuring the different elements that make up the local government's fiscal condition in Taiwan. Following Kleine et al.'s works [9], a performance standard of each indicator is established and then used for the grading of local government's fiscal condition. If the government meets the indicator standard, score a 0 in that indicator, otherwise, it was assigned a 1. The definition and performance standard of the nine indicators are described as follows:

### A. Population Growth

It is clear that an increase in population will bring in more taxpayers and will result in a better fiscal condition of a government. If a local government has a negative growth rate in population scored a 1; otherwise scored a 0. Annual data on population growth rate are taken from Year Book of Population Statistics of Taiwan.

### B. Actual Tax Collection Growth

Local government's actual tax collection generally benefit from a booming national economy. If the government experienced negative growth in the actual tax collection, it scored a 1; Governments that experienced a decline below the threshold in the growth of actual tax collection received a 1 and others were marked 0. The annual data on actual tax collection are taken from Year Book of Financial Statistics of Taiwan.

### C. Decrease in Actual Tax Collection Growth

Fiscal distress is likely to occur if local government experienced a severe decrease in the growth of actual tax collection. The value of a one-half standard deviation below sample median of the growth rate was chosen as the threshold of severe decrease in the growth of actual tax collection. For this indicator, governments that measured below the threshold value scored a 1; otherwise marked 0.

### D. Government Expenditures as a Percentage of Actual Tax Collection

Ratios of annual expenditures to the actual tax collection indicates the scale of a tax base needed for supporting a government functioning. A higher ratio represents a higher possibility for fiscal distress. To assess the possibility of fiscal distress, value of one-half standard deviation above the sample median of these ratios was used to serve as the threshold for evaluating the tax scale for operating a government. For this indicator, local governments with ratios above the threshold value received a 1, indicates that these government scale are fairly large relative to the tax base that supports them, hence have a higher possibility to experience fiscal distress; governments below the threshold value received a 0. Annual data on annual government expenditure and actual tax collection are taken from Annual Report of Municipal, County and City Final Accounts of Taiwan.

### E. Fiscal Deficit

If the local government does not have budget deficit, or if the

deficit relative to revenue is less than 1%, its indicator score is 0; governments with deficit greater than 1% of revenue, indicating local governments has a nontrivial deficit, the indicator scored 1. Annual data on revenues and expenditures are taken from Annual Report of Municipal, County and City Final Accounts of Taiwan.

*F. Prior Fiscal Deficit*

A single year deficit is considered only a minor sign of fiscal distress, however as the deficit accumulated over time, it should be more concerned as a serious sign of fiscal distress. This indicator captures this type of concern by measuring whether the local government had a deficit during the past two years. The sixth indicator uses the same data as those used by the fifth indicator; the only change is that a different assessment standard is used. Follows the previous definition of deficit, if the local government had deficits for both two previous years, it would receive a score of 2 for this indicator. If local government had one deficit during the past two years, it would score a 1 on this indicator; otherwise, scored a 0.

*G. Tax Revenues a Percentage of Government Expenditures*

Tax revenues have been an important financial source of government expenditures in Taiwan. Increase in tax revenues will bring in a sounder finance of government, and it is a sign of fiscal distress for governments if the tax revenues are less than the annual expenditures. Governments typically find it beneficial to keep their ratio of tax revenues to annual expenditures from declining too much, as this will inhibit the ability of local governments to meet their financial and service obligations.

The variable constructed for this indicator is the tax revenues as a percentage of government annual expenditures. There is some debate as to how much this ratio should be. This paper uses a one-half standard deviation above the sample median to serve as the threshold of the standard. Local governments with ratios below the standard, received a score of 1, indicating governments are fairly lack of their own finance, hence have a higher possibility to experience fiscal distress; governments with ratios above the standard received a 0. The annual data on tax revenues and government expenditures are taken from Annual Report of Municipal, County and City Final Accounts of Taiwan.

*H. Revenues from Aid and Assistance as a Percentage of Government Expenditures*

Revenues of aid and assistance are one of the sources for local government in Taiwan to meet their financial and service obligations. If the high proportions of local expenditures are coming from revenues of aid and assistance, indicates that local governments are over rely on the intergovernmental grants to finance their expenditures, hence are easily to experience fiscal distress.

The variable constructed for this indicator is the revenues of aid and assistance as a proportion of annual government expenditures. A one-half standard deviation above the sample median is used to serve as the threshold of the standard. Local governments with ratios above the standard received a score of

1; governments with ratios below the standard received a 0. The annual data on revenues of aid and assistance and government expenditures are taken from Annual Report of Municipal, County and City Final Accounts of Taiwan.

*I. Revenues from Loans as a percentage of Actual Tax Collection*

Large loans relative to government's actual tax collections signified a clear fiscal distress for the local government. This indicator is constructed by taking revenues from loans and dividing it by the actual tax collection. A one-half standard deviation above the sample median is used to serve as the threshold of the standard. Local governments with ratios above the standard received a score of 1 on this indicator; indicates that governments are highly possible to experience fiscal distress; governments with ratios below the standard received a score of 0. The annual data on revenues from loans and actual tax collections are taken from Annual Report of Municipal, County and City Final Accounts of Taiwan.

The nine indicators are equally weighted, and aggregate to provide an overall picture of a government's fiscal health, resulting in a total points ranging from 0 to 10. A government score of 10 indicates severe fiscal distress and a score of 0 or 1 indicates no distress.

We compute each local government's annual fiscal health score by pooling the annual scores for all governments across all years and computing the standard deviation of the pooled indicators from the sample median. The median for our research sample is 2, with a standard deviation of 2.1723. We elected to use the median instead of the mean value for this study because the distribution of health indicators takes on a skewed shape.

An early warning system according to the 10-point scale is developed to help government officials identify fiscally troubled localities and suitable corresponding strategies under different economics situations. The critical value used for classification is a one-half standard deviation below median ( $C_1$ ), and a one-half standard deviation above median ( $C_2$ ). In our study,  $C_1$  takes value of 1 and  $C_2$  takes value of 4. Local governments with a score of 0 and 1 indicate a fiscal health, where the overall monitoring indicator flashes a "blue" signal; a score 5 or above indicate a severe fiscal distress, where the overall monitoring indicator flashes a "red" signal; a score of 2, 3 and 4 indicate a moderate situation with a little distress, where the overall monitor indicator flashes a "yellow" signal. The monitoring signals of fiscal health are listed in Table I. The results of this application are reported in Tables II and III, which list the health scores and health categories of Taiwan local governments from 1984 to 2010.

TABLE I  
 MONITORING SIGNALS OF FISCAL HEALTH

Signals	Blue	Yellow	Red
Fiscal Health	Good	Moderate	Distress
Check Points	$\leq C_1$	$> C_1$ & $\leq C_2$	$> C_2$

TABLE II  
 FISCAL HEALTH SCORES OF TAIWAN LOCAL GOVERNMENTS

III. RESULTS

As Tables II and III show, most of Taiwan's localities did not experience fiscal difficulty during 1985 to 2005. However, variations were noticed over the 2005 to 2010 period. In 1990, only 2 out of 21 local governments scored a 5, while in 2005, 5 out of 21 local governments scored a 5 or above, and in 2010 that number had risen to 14. Our results show that the economic and social aspects of the environment in which local governments provide services characterize the fiscal condition of the units assessed. As a result of these study results, we are able to identify a policy to improve the position of local governments in a much more targeted way, by identifying a suitable fiscal policy for the local government to achieve fiscal balance in the long run. Table IV presents Taiwan's fiscal distress early warning system and the corresponding strategies.

As shown in Table IV, the corresponding strategies of different combinations of health categories and economic conditions are described as follows:

- 1) When a local government is in good fiscal health with no distress, and the overall economy is booming, central and local governments should implement fiscal disciplines to achieve a long-term fiscal balance.
- 2) When a local government is in good fiscal health with no distress, and the overall economy is stable, the central government may adopt expansionary policies or allow the local government to have more fiscal autonomy, which leads to increase in the local government's own sources of revenues and promotes local economic development.
- 3) When a local government is in good fiscal health with no distress, and the overall economy is sluggish, the central government may adopt expansionary policies or allow the local government to have more fiscal autonomy in order to increase local government's own source of revenues and to promote local economic development.
- 4) When a local government is in a moderate situation with a little fiscal distress, and the overall economy is booming, the central government should adopt contractionary policies, providing local government an incentive of fiscal effort, allowing local government to levy new taxes, requesting more fiscal transparency, and at the same time enhancing fiscal auditing on local government.
- 5) When a local government is in a moderate situation with a little fiscal distress, and the overall economy is stable, the central government should provide local government an incentive of fiscal effort, allowing local government to have more fiscal autonomy in order to increase local government's own-source revenues and promoting local economic development.

County	1984	1985	1986	1987	1988	1989	1990	1991	1992
Taipei	0	0	1	0	0	0	1	3	2
Yilan	2	3	2	1	1	0	3	4	2
Taoyuan	0	0	1	0	0	0	0	0	0
Hsinchu	1	2	3	2	1	0	1	1	1
Miaoli	2	1	3	1	1	1	0	2	0
Taichung	0	1	2	2	1	0	2	2	1
Changhua	0	0	0	0	0	0	0	4	1
Nantou	1	1	4	2	1	0	3	4	2
Yunlin	2	1	4	2	2	2	5	6	4
Chiayi	2	3	5	4	3	3	5	4	3
Tainan	0	0	1	0	0	0	1	2	0
Kaohsiun	0	0	2	0	0	0	1	2	1
Pingtung	1	2	2	1	2	2	2	1	2
Taitung	3	4	4	4	3	2	4	3	3
Hualien	1	2	5	1	2	1	1	3	1
Penghu	4	4	4	3	3	3	4	4	4
Keelung	2	3	4	3	2	1	2	2	1
Hsinchu*	1	0	2	0	0	0	0	0	0
Taichung*	0	0	1	1	0	0	1	3	1
Chia Yi*	3	3	4	2	2	0	0	1	1
Tainan*	0	0	1	0	0	0	0	2	0

  

County	1993	1994	1995	1996	1997	1998	1999	2000	2001
Taipei	1	0	0	1	0	0	1	2	3
Yilan	1	1	0	0	0	3	4	5	5
Taoyuan	0	0	0	1	0	0	0	2	4
Hsinchu	0	0	0	1	0	1	1	2	5
Miaoli	1	1	2	3	2	3	3	6	7
Taichung	0	0	0	1	1	1	3	6	6
Changhua	0	0	0	1	0	1	3	5	5
Nantou	3	2	4	6	5	6	4	9	6
Yunlin	4	4	3	4	5	2	6	4	3
Chiayi	3	4	5	6	2	6	6	7	6
Tainan	0	0	0	1	0	1	2	3	4
Kaohsiun	1	0	1	1	0	2	1	5	4
Pingtung	2	1	2	4	4	5	5	6	5
Taitung	3	3	4	4	5	3	3	5	6
Hualien	2	1	1	2	1	2	3	4	4
Penghu	4	4	4	3	3	4	3	3	5
Keelung	1	2	0	2	2	0	2	1	3
Hsinchu*	0	0	0	0	0	0	1	0	0
Taichung*	0	0	0	1	0	0	1	2	0
Chia Yi*	1	0	1	1	1	0	1	2	4
Tainan*	0	1	0	2	0	1	4	4	4

  

County	2002	2003	2004	2005	2006	2007	2008	2009	2010
Taipei	4	3	2	0	1	3	4	5	3
Yilan	5	4	4	5	5	7	5	5	6
Taoyuan	4	3	3	3	4	6	4	4	2
Hsinchu	6	7	5	5	6	5	5	7	5
Miaoli	5	4	5	4	5	4	5	5	6
Taichung	3	4	4	4	3	4	2	5	2
Changhua	4	5	2	2	4	3	3	7	6
Nantou	5	9	5	4	6	5	8	7	7
Yunlin	5	5	6	5	4	5	5	7	5
Chiayi	5	7	5	4	6	6	7	7	7
Tainan	6	5	5	3	4	3	4	7	5
Kaohsiun	5	2	0	0	2	2	3	6	4
Pingtung	6	6	4	3	4	4	5	7	6
Taitung	8	8	6	6	7	6	7	5	5
Hualien	6	6	5	5	4	5	5	7	5
Penghu	6	6	5	4	6	5	4	7	7
Keelung	0	2	1	4	2	5	5	7	6
Hsinchu*	4	4	3	3	2	3	3	6	4
Taichung*	1	1	1	1	1	1	0	2	0
Chia Yi*	5	4	1	1	1	1	1	1	2
Tainan*	5	5	2	1	2	3	5	6	8

Note: \* signifies City.

TABLE III

FISCAL HEALTH SIGNALS OF TAIWAN LOCAL GOVERNMENTS

County	1984	1985	1986	1987	1988	1989	1990	1991	1992
Taipei	B	B	B	B	B	B	B	Y	Y
Yilan	Y	Y	Y	B	B	B	Y	Y	Y
Taoyuan	B	B	B	B	B	B	B	B	B
Hsinchu	B	Y	Y	Y	B	B	B	B	B
Miaoli	Y	B	Y	B	B	B	B	Y	B
Taichung	B	B	Y	Y	B	B	Y	Y	B
Changhua	B	B	B	B	B	B	B	Y	B
Nantou	B	B	Y	Y	B	B	Y	Y	Y
Yunlin	Y	B	Y	Y	Y	Y	R	R	Y
Chiayi	Y	Y	R	Y	Y	Y	R	Y	Y
Tainan	B	B	B	B	B	B	B	Y	B
Kaohsiun	B	B	Y	B	B	B	B	Y	B
Pingtung	B	Y	Y	B	Y	Y	Y	B	Y
Taitung	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hualien	B	Y	R	B	Y	B	B	Y	B
Penghu	Y	Y	Y	Y	Y	Y	Y	Y	Y
Keelung	Y	Y	Y	Y	Y	B	Y	Y	B
Hsinchu*	B	B	B	B	B	B	B	B	B
Taichung*	B	B	B	B	B	B	B	Y	B
Chia Yi*	Y	Y	Y	Y	Y	B	B	B	B
Tainan*	B	B	B	B	B	B	B	Y	B
County	1993	1994	1995	1996	1997	1998	1999	2000	2001
Taipei	B	B	B	B	B	B	B	Y	Y
Yilan	B	B	B	B	B	Y	Y	R	R
Taoyuan	B	B	B	B	B	B	B	Y	Y
Hsinchu	B	B	B	B	B	B	B	Y	R
Miaoli	B	B	Y	Y	Y	Y	Y	R	R
Taichung	B	B	B	B	B	B	Y	R	R
Changhua	B	B	B	B	B	B	Y	R	R
Nantou	Y	Y	Y	R	R	R	Y	R	R
Yunlin	Y	Y	Y	Y	R	Y	R	Y	Y
Chiayi	Y	Y	R	R	Y	R	R	R	R
Tainan	B	B	B	B	B	B	Y	Y	Y
Kaohsiun	B	B	B	B	B	Y	B	R	Y
Pingtung	Y	B	Y	Y	Y	R	R	R	R
Taitung	Y	Y	Y	Y	R	Y	Y	R	R
Hualien	Y	B	B	Y	B	Y	Y	Y	Y
Penghu	Y	Y	Y	Y	Y	Y	Y	Y	R
Keelung	B	Y	B	Y	Y	B	Y	B	Y
Hsinchu*	B	B	B	B	B	B	B	B	B
Taichung*	B	B	B	B	B	B	B	Y	B
Chia Yi*	B	B	B	B	B	B	B	Y	Y
Tainan*	B	B	B	Y	B	B	Y	Y	Y
County	2002	2003	2004	2005	2006	2007	2008	2009	2010
Taipei	Y	Y	Y	B	B	Y	R	R	Y
Yilan	R	Y	Y	R	R	R	R	R	R
Taoyuan	Y	Y	Y	Y	Y	R	Y	Y	Y
Hsinchu	R	R	R	R	R	R	R	R	R
Miaoli	R	Y	R	R	R	Y	R	R	R
Taichung	Y	Y	Y	Y	Y	Y	Y	R	Y
Changhua	Y	R	Y	Y	Y	Y	Y	R	R
Nantou	R	R	R	Y	R	R	R	R	R
Yunlin	R	R	R	R	R	R	R	R	R
Chiayi	R	R	R	Y	R	R	R	R	R
Tainan	R	R	R	Y	Y	Y	Y	R	R
Kaohsiun	R	Y	B	Y	Y	Y	Y	R	Y
Pingtung	R	R	Y	Y	R	R	R	R	R
Taitung	R	R	R	R	R	R	R	R	R
Hualien	R	R	R	R	R	R	R	R	R
Penghu	R	R	R	Y	R	R	Y	R	R
Keelung	B	Y	B	R	Y	R	R	R	R
Hsinchu*	Y	Y	Y	Y	Y	Y	Y	R	Y
Taichung*	B	B	B	B	B	B	B	Y	B
Chia Yi*	R	Y	B	B	B	B	B	B	Y
Tainan*	R	R	Y	B	Y	Y	R	R	R

Notes: B stands for "blue" signal indicates a fiscal health situation; Y stands for "yellow" signal indicate a moderate situation; R stands for "red" signal indicate a severe fiscal distress.

TABLE IV

EARLY WARNING SYSTEM AND CORRESPONDENCE POLICY

Health Category	Economics Situation	Policy Responses
Good with no distress	Booming	Fiscal disciplines
	Stable	Expansionary policies
	Sluggish	Expansionary policies
Moderate with a little distress	Booming	Contractionary policies, fiscal autonomy
	Stable	Expansionary policies, fiscal autonomy
	Sluggish	Expansionary policies, fiscal autonomy
Bad with severe fiscal distress	Booming	Contractionary policies, fiscal autonomy
	Stable	Expansionary policies, fiscal autonomy
	Sluggish	Expansionary policies, fiscal autonomy

- 6) When a local government is in a moderate situation with a little fiscal distress, and the overall economy is sluggish, the central government may adopt expansionary policies, providing local government an incentive of fiscal effort, requesting more fiscal transparency and allowing local government to have more fiscal autonomy in order to increase local government's own-source revenues and promoting local economic development.
- 7) When a local government is in a severe fiscal distress, and the overall economy is booming, the central government should adopt contractionary policies, providing local government an incentive of fiscal effort, allowing local government to have more fiscal autonomy to levy new taxes, requesting more fiscal transparency and at the same time enhancing fiscal auditing on local government.
- 8) When a local government is in a severe fiscal distress, and the overall economy is stable, the central government should provide local government an incentive of fiscal effort, allowing local government to have more fiscal autonomy so as to increase local government's own sources of revenues and promoting local economic development.
- 9) When a local government is in a severe fiscal distress, and the overall economy is sluggish, the central government may adopt expansionary policies, providing local government an incentive of fiscal effort, requesting more fiscal transparency and allowing local government to have more fiscal autonomy so as to increase local government's own-source revenues and promoting local economic development.

#### IV. CONCLUSIONS

In this paper we have developed an early warning system to monitor Taiwan local government fiscal health. The system was developed based on a 10-point scale of fiscal distress, proposed by Kleine et al. [9]. The 10-point scale of fiscal distress is a composite of nine budgetary and socioeconomic indicators capable of measuring the different elements that make up the local government's fiscal condition in Taiwan. The early warning system enables government officers to identify the fiscal distress problem, and to make policies which consist of and enhance both "economic growth" and "fiscal sustainability" under different phases of business cycles.

As the early warning system shows, when a local government is in a severe fiscal distress, and the overall

economy is sluggish, the central government may adopt expansionary policies and allow the local government to have more fiscal autonomy in order to increase local government's own sources of revenues and to promote local economic development; if the overall economy is booming, the central government should adopt contractionary policies, providing local government an incentive of fiscal effort, and allowing local government to have more fiscal autonomy to levy new taxes.

When a local government is in good fiscal health with no distress, and the overall economy is booming, both central and the local governments should implement fiscal disciplines to achieve a long-term fiscal balance; if the whole economy is sluggish, the central government may adopt expansionary policies or allow the local government to have more fiscal autonomy in order to increase local government's own sources of revenues and to promote local economic development.

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