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**BUDGET BALANCE AND TRADE BALANCE:
KIN OR STRANGERS. A CASE STUDY OF
TAIWAN**

by

Hsiao-chuan Chang

Department of Economics
The University of Melbourne
Melbourne Victoria 3010
Australia.

Budget Balance and Trade Balance: Kin or Strangers A Case Study of Taiwan

Hsiao-chuan Chang*

Department of Economics
The University of Melbourne

Phone: 61-3-83445364
Fax: 61-3-83446899
Email: changh@unimelb.edu.au

Abstract

In line with the deterioration of Taiwanese budget deficits, the trade surplus has also decreased. It is the ideal time to investigate the relationship between budget balances and trade balances. Unit root tests, cointegration tests, Granger causality tests and the VARs model are techniques used to test the Keynesian proposition and the Ricardian equivalence. The main findings are that Keynesian proposition is supported only by the model using data of the whole period. There is no support for the Ricardian equivalence. That budget balances and trade balances being kin or strangers varies over periods of data used.

JEL classification: H50;H62;C32

Key Words: Keynesian proposition, Ricardian equivalence, unit root tests, Granger causality tests, VARs model

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Budget Balance and Trade Balance: Kin or Strangers A Case Study of Taiwan

1. Introduction

The budget balance of the Taiwanese government has turned into an ongoing deficit since 1989. In 1988 there was a surplus of NT\$25.95 billion, plummeting to a deficit of NT\$288.58 billion in 1989. Since then, a deterioration of government deficits has emerged, a deficit of NT\$635.13 billion in 2001 reaching a historical record high. The trade balance of Taiwan follows its historical record of surpluses but compared to the second half of 1980s, it has been fluctuating within a relatively low range since 1990s (2001 and 2002 are exceptional). Taiwan has been recognized as an outstanding economy since the middle of 1980s. During the second half of 1980s the Taiwanese government ran relatively small budget deficits (and sometimes the budget was in surplus) and accumulated large foreign reserves through its successful outward trading. ‘Twin deficits’, an issue used to catch economists’ attention in a range of countries, seemed never to be a focus of the research on Taiwanese economy. The two facts alluded to above, i.e. a deterioration of budget deficits and a less well performing of trade balances, means it is the ideal time to investigate the linkage between the budget balance and the trade balance for the case of Taiwan.

The conventional wisdom of the ‘twin deficits’ is that no matter whether the relationship is weak or strong, a relationship exists and budget deficits induce a negative change in trade balances (Sachs and Roubini 1987, Bernheim 1988, Miller and Russek 1989,

Enders and Lee 1990, Bachman 1992, Akhtar 1994, Kasa 1994, Hung and Charette 1997, Vamvoukas 1997 and Leachman and Francis 2002). The economic reasoning provided by Bernheim (1988) is that government debts decrease the domestic supply of funds available to finance new investment, which leads to an inflow of funds from overseas. An offsetting adjustment to the current account entails trade deficits. Abel (1990a, b) suggests that interest rates and exchange rates are the primary transmission channels. This view is understood as the 'Keynesian proposition'. Challenges come from other research, for example Tufte (1996) criticizes the methodology used in Bachman (1992) and refutes his findings. Fisher (1995) argues against the accuracy of the traditional measure of the current account and casts doubt on the connection between the twin deficits. An alternative explanation is provided by the Ricardian equivalence hypothesis when research fails to find a positive relationship between the budget deficits and the trade deficits. The Ricardian equivalence hypothesis bails out the cause of trade deficits via budget deficits by justifying the households' reaction to government debts as being to increase their savings to prepare for a future raise of taxation. Seater (1993) conducted a fairly comprehensive review of both theoretical and empirical studies to support the explanation using Ricardian equivalence.

This paper re-investigates the issue of 'twin deficits' which is under debate and employs time series data to run the econometric testing and modelling to explore whether Keynesian proposition or Ricardian equivalence is applicable to the case of Taiwan. This paper does not presume a failure of the Keynesian proposition implies a hold of Ricardian equivalence, and vice versa. Therefore, both the Keynesian proposition and the Ricardian

equivalence are tested. In terms of testing Ricardian equivalence, both of the excess of investment over private saving (I-S) and private saving (S) are investigated separately for their relationship with budget balance. The reason for using the excess of investment over private saving (I-S) is that following the result from the national accounting identities there is a linkage between I-S and the budget balance. The reason for using private saving (S) is that following the theoretical upshot of Ricardian equivalence, all other variables can be left unchanged and only private savings absorb the impact of budget deficits. In addition to the conventional ADF tests, this paper uses a range of unit root tests, including DF-GLS tests, KPSS tests and a group of *M*-tests, to detect the time series data to be I(1) or I(0). Furthermore, cointegration tests, Granger causality tests and regressions based on VARs are the central methodology used in this paper. This paper detects the relationship between budget balance and trade balance in terms of three time frames. Firstly, the whole period, i.e. from 1967:1 to 2003:2 is under investigation. Secondly, the data is separated by the end of 1986, i.e. the set of data from 1967:1 to 1986:4 is the first group and the rest is the second group. This is because the exchange rate of the new Taiwan dollar appreciates to a historical high percentage by almost 20% from 1986 to 1987. Prior to 1987, the exchange rates are mainly controlled by the Central Bank of Taiwan. Since 1987, the value of the new Taiwan dollar has been increasingly determined under a market-oriented system. Leachman and Francis (2002) argue that “transmission mechanisms for twin deficits vary according to the exchange rate regime” This research takes their comments into account and investigates the data in two exchange rate regimes to avoid noises, if they exist, from the transmission mechanisms. Thirdly, since the deterioration of the government budget deficit started from late 1980s,

the data from 1989:1 to 2003:2 is also investigated separately. To test the Ricardian equivalence, only the whole period of annual data is investigated due to the existence only of annual data of private savings, which do not have a satisfactory length to be grouped into different periods.

The main findings are that Keynesian proposition is supported by the model using data of the whole period but is not supported by other models using data from different periods. There is no support for the Ricardian equivalence for the case of Taiwan. This paper discloses the complexity of this issue than one could expect. The results imply that the budget balance and the trade balance being kin or strangers depends on the data in two aspects. First, the source of data, i.e. different country conducts different policies, hence provides different evidence. Second, the period of data. Which period is ideal for testing remains a decision of researcher and availability of data.

2. Theoretical Framework

Conventionally, the national income accounting identities are employed to expose the linkage between the government budget balance and the trade balance.

$$(1) \quad Y = C + I + G + (X - M),$$

where Y is the income, C is the consumption, I is the investment, G is the government purchases, X is the exports and M is the imports. Individuals dispose of income (Y) either as consumption, savings (S) and taxes (T) as follows,

$$(2) \quad Y = C + S + T.$$

Therefore, the government budget balance ($T - G$) and the trade balance ($X - M$) have the following relationship,

$$(3) \quad T - G = (X - M) + (I - S).$$

Equation (3) states that the government budget balance comprises the trade balance and the excess of investment over private saving ($I - S$). It provides the fundamentals for the Keynesian proposition of which the ‘twin deficits’, i.e. the budget deficit and the trade deficit, are closely linked. The theory behind the Keynesian proposition is that government debts crowd out the funds available to private investments, therefore increase the interest rate. Under the framework of an open economy, a high domestic interest rate attracts international funds to inflow, which drives the domestic currency towards appreciation. This is going to hurt the exporting sectors and to benefit the importing sectors, therefore, pull towards a trade deficit.

Equation (3) also substantiates the view of Ricardian equivalence that the trade balances could be left unchanged if the variations of the budget deficits are fully reflected by

variations of private savings. Theoretically, as asserted by Seater (1993), Ricardian equivalence is a straightforward generalization of the permanent income/life cycle hypothesis (PILCH). In contrast to the Keynesian proposition, the upshot of Ricardian equivalence asserts that the private savings moves one-to-one with changes in the government debts, with no change in interest rates, therefore no change in exchange rates and in trade balances, and none of the crowding out of private investments.

3. Data

All data are from the official sources including the Directorate-General of Budget Accounting and Statistics (DGBAS) and the Taiwan Statistical Data Book 2002. The government budget balance (BB) and the trade balance (TB) are the quarterly data from 1967:1 to 2003:2. The annual data of government budget balance (BB^A) are used with the annual data of the excess of investment over private saving (I-S) and the private saving (S) from 1967 to 2002 while testing the Ricardian equivalence due to the quarterly data of private savings being not available. The raw data are presented in Appendix 1. The first-order difference of the budget balance (DBB) and of the trade balance (DTB) are the difference between the same quarters of two consecutive years.

4. Unit Root Tests

Conventionally, ADF and PP tests are the two used for unit root testing, especially, ADF tests. However, both tests are often criticized by econometricians for their unsatisfactory

performance. More updated unit root tests have been developed during the past decade, such as DF-GLS tests, a modified ADF test with a GLS detrended data, is proposed by Elliott, Rothenberg, and Stock (1996), KPSS tests developed by Kwiatkowski, Phillips, Schmidt and Shin (1992) and a group of *M*-tests, which are the modified forms of PP tests and are based upon the GLS detrended data, developed by Ng and Perron (2001)¹. Hayashi (2000: Ch.9) finds that a new generation of unit root tests with reasonably low size distortions and good power includes the DF-GLS tests and the NP's *M*-tests². In addition to paying attention to these two types of tests, results from other tests are also taken into account. These unit root tests are delivered using the package EViews. All tests in this paper are using a significance level of 5%. Since the results could be different from different tests, a simple rule is used to make a decision that a series is $I(1)/I(0)$ if a larger number of tests favouring to $I(1)/I(0)$.

4.1 The Whole Period: 1967:1-2003:2³

Table 1 presents the results of unit root tests for the whole period. By following the simple rule alluded to above, a consistent conclusion is reached which states that series of BB, BB^A, TB and S are regarded as $I(1)$ whereas DBB, DBB^A, DTB, DS and I-S are $I(0)$ ⁴.

¹ For details, refer to the papers.

² The *M*-tests indicated by Hayashi (2000) include the first three types of tests in Table 1 based on Perron and Ng (1996).

³ For annual data, the period covers from 1967 to 2002.

⁴ 'A consistent conclusion' means that when a series in level presents $I(1)$, its first-order difference should present $I(0)$.

Table 1. Results of the Unit Root Tests: 1967:1-2003:2

	ADF		DF-GLS	KPSS		NP's <i>M</i> -tests			
	IN	IN+T				MZ _a	MZ _t	MSB	MP _T
			IN	IN	IN	IN			
BB	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)
TB	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)	I(1)	I(0)
DBB	I(0)	I(0)	I(0)	I(0)	I(1)	I(0)	I(0)	I(1)	I(1)
DTB	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)	I(1)
BB^A	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(0)
I-S	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)	I(1)	I(0)	I(0)
DBB^A	I(0)	I(0)	I(0)	I(1)	I(1)	I(0)	I(0)	I(1)	I(1)
S	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(0)
DS	I(0)	I(0)	I(0)	I(1)	I(1)	I(0)	I(0)	I(1)	I(1)

Note:

1. "IN" stands for the intercept. "IN+T" stands for the intercept plus the trend. "BB" stands for the quarterly budget balance. "TB" stands for the quarterly trade balance. "BB^A" stands for the annual budget balance. "I-S" stands for the annual excess of investment over private saving. "S" stands for the annual private saving. "DBB" and "DTB" respectively stands for the first-order difference of the budget balance and of the trade balance between the same quarters of two consecutive years. DBB^A and DS are the first-order difference of the budget balance and the private saving from annual data.
2. DF-GLS performs a test of the modified ADF in which the data are detrended.
3. NP's *M*-tests are the modified forms of PP tests in which the data are detrended.
4. All testing results are based on a 5% significance level.
5. BB^A stands for the annual data.
6. When the first-order difference of variables are tested under a specific test with a result of being non-stationary, it implies that the variables in levels are integrated at least with order 2, i.e. I(2). Since there is no contradiction presented by the conclusive results in terms of the integrated order and keep searching for the integrated order under a specific test is not a main task in this research, only I(1) is symbolized if a rejection of stationarity holds.

4.2 The Second Time Frame: 1967:1-1986:4 and 1987:1-2003:2

Table 2 shows the unit root tests for the data in two different periods. The consistent conclusion is that series of BB86, BB03, TB86, TB03 are I(1) whereas DBB86, DBB03, DTB86, DTB03 are I(0).

Table 2. Results of the Unit Root Tests: 1967:1-1986:4 and 1987:1-2003:2

	ADF		DF-GLS	KPSS		NP's <i>M</i> -tests			
	IN	IN+T		IN	IN	IN+T	MZ _a	MZ _t	MSB
			IN				IN	IN	IN
BB86	I(1)	I(0)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)
TB86	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(0)
BB03	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(0)
TB03	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)	I(1)	I(0)	I(0)
DBB86	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)	I(1)
DTB86	I(1)	I(0)	I(0)	I(1)	I(1)	I(0)	I(0)	I(1)	I(0)
DBB03	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)	I(1)
DTB03	I(0)	I(0)	I(0)	I(1)	I(0)	I(0)	I(0)	I(1)	I(1)

Note:

1. "BB86" and "BB03" stands for the budget balance of 1967:1-1986:4 and of 1987:1-2003:2. "TB86" and "TB03" stands for the trade balance of 1967:1-1986:4 and of 1987:1-2003:2. "DBB86" stands for the first-order difference of the budget balance in the period of 1967:1-1986:4, and so on.

4.3 The Third Time Frame: 1989:1-2003:2

Table 3 shows the unit root tests for the data in the period of 1989:1-2003:2. The consistent conclusion is that series of BB89 and TB89 are I(1) whereas DBB89 and DTB89 are I(0).

Table 3. Results of the Unit Root Tests: 1989:1-2003:2

	ADF		DF-GLS	KPSS		NP's <i>M</i> -tests			
	IN	IN+T		IN	IN	IN+T	MZ _a	MZ _t	MSB
			IN				IN	IN	IN
BB89	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(0)
TB89	I(1)	I(1)	I(0)	I(1)	I(1)	I(0)	I(0)	I(1)	I(1)
DBB89	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)	I(1)	I(0)	I(0)
DTB89	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)	I(1)

All the unit root tests show, no matter which period it is, all series in level are I(1), except for the series of I-S, and their first-order differences are I(0). This result qualifies a test

for cointegration of budget balances and trade balances in different periods so as to test for cointegration of budget balances and private savings.

5. Cointegration Tests

Cointegration tests are conducted by using SHAZAM programme and the result from all cointegration tests shows that the data do not support a long-run relationship between (T-G) and (X-M), and between (T-G) and S. Theoretically, the Keynesian proposition implies its hold should be over a long term due to the adjustment process moving through a change in interest rates and in exchange rates. The Ricardian equivalence seems to support a short-run relationship between budget deficits and private savings due to the one-to-one move of private savings following budget deficits. However, empirically the length of time to restore an equilibrium under both Keynesian and Ricardian framework remains inconclusive. Thus, it is still interesting to test both by adding some lags in the model. The Granger causality test, depending on the length of lags used, can be used to investigate a short-run relationship between variables. This test detects the precedence of one variable to the other⁵. The next section presents the Granger causality tests and the first-order difference of variables showing $I(0)$ is used.

6. Granger Causality Tests

⁵ As pointed out by Maddala (1992: Ch.9) “Leamer suggests using the simple word ‘precedence’ instead of the complicated word Granger causality since all we are testing is whether a certain variable precedes another and we are not testing causality as it is usually understood.”

Granger causality tests are executed through running a model of VAR(p) and a statistic of joint-F is conducted to deliver conclusions by using the programme in SHAZAM. The lag p is determined by using a range of lag-order selection criteria such as sequential modified Likelihood Ratio test (LR), Akaike Information Criterion (AIC), Schwarz Criterion (SC), Final Prediction Error (FPE) and Hannan-Quinn Criterion (HQ)⁶. The system of equations is as follows with Y and X being the two time series.

$$(4) \quad Y_t = \alpha_{1t} + \sum_{i=1}^p \beta_{1i} \cdot Y_{t-i} + \sum_{i=1}^p \gamma_{1i} \cdot X_{t-i} + \mu_{1t}, \quad \mu_{1t} \sim i.i.d.N(0, \sigma_{\mu_1})$$

$$(5) \quad X_t = \alpha_{2t} + \sum_{i=1}^p \beta_{2i} \cdot X_{t-i} + \sum_{i=1}^p \gamma_{2i} \cdot Y_{t-i} + \mu_{2t}, \quad \mu_{2t} \sim i.i.d.N(0, \sigma_{\mu_2})$$

6.1 Tests for Keynesian Proposition

Tests in this sub-section are focused on the budget balances and the trade balances in different periods.

6.1.1 The Whole Period: 1967:1-2003:2

A model of VAR(4), with variables of DBB and DTB in Table 1, is used. The lag length four is picked by the most of lag-order selection criteria⁷. There are two steps to follow. Firstly, to test the Granger causality from DTB to DBB; secondly, to test the other way

⁶ Refer to the manual of EVIEWS for details.

⁷ AIC, SC, HQ and FPE tests suggest lag four.

around. The null hypothesis is that there is no Granger causality from one variable to the other. The results are that DTB does not Granger causes DBB but DBB Granger causes DTB. Table 4 summaries the results.

Table 4. Results from Granger Causality Tests: 1967:1-2003:2

<i>Step 1: Null Hypothesis: No Granger Causality from DTB to DBB</i>				
Variable	SUM(COEFS)	STD Error	Joint-F	P-Value
DBB	-0.43290	0.131	14.6	0.000
DTB	0.11259	0.130	0.956	0.434
Conclusion: fail to reject the null hypothesis				
<i>Step 2: Null Hypothesis: No Granger Causality from DBB to DTB</i>				
DTB	0.56956	0.935E-01	24.6	0.000
DBB	0.24950	0.946E-01	3.11	0.018
Conclusion: reject the null hypothesis				

The result shows that DBB precedes DTB. Table 5 shows the details of the VAR(4) model.

Table 5. Results of the VAR(4) Model: 1967:1-2003:2

	DBB ₋₁	DBB ₋₂	DBB ₋₃	DBB ₋₄	DTB ₋₁	DTB ₋₂	DTB ₋₃	DTB ₋₄	C
DBB _t	0.103 (0.177)	0.024 (0.762)	0.011 (0.886)	-0.571 (0.000)*	-0.142 (0.211)	0.016 (0.898)	0.100 (0.415)	0.138 (0.243)	-5726.1 (0.059)
DTB _t	0.083 (0.129)	-0.060 (0.292)	0.082 (0.158)	0.144 (0.013)*	0.520 (0.000)*	0.114 (0.197)	0.331 (0.000)*	-0.395 (0.000)*	3316.1 (0.127)

- Note: 1. Numbers in parenthesis are the p-values.
 2. * means the statistic is significant at 5% confidence interval.
 3. C stands for the constant.
 4. The subscript attached to each variable stands for the lag.

Table 5 shows that DBB has a significant and positive impact on DTB at lag four. However, DTB has no significant effect on DBB. The result shows that one dollar increase/decrease in DBB results in an 11.4 cent increase/decrease in DTB. Given the

current situation of Taiwan, a decrease of one dollar in the budget deficit between period 0 and 1, i.e. one dollar increase in the budget balance, then an increase of 11.4 cents in the trade surplus would be expected between period 4 and 5. Since quarterly data are used, four lags means one year. This positive relationship between DBB and DTB supports the Keynesian Proposition under a time spread of one year.

6.1.2 The Second Time Frame: 1967:1-1986:4 and 1987:1-2003:2

A model of VAR(3), with variables of DBB86 and DTB86 in Table 2, is employed to test data for the period of 1967:1-1986:4 during which the exchange rates are highly controlled by the government. The lag length three is chosen by VIC and FPE tests⁸. The result is that DBB86 and DTB86 do not Granger cause each other. Table 6 shows the details of Granger causality tests.

Table 6. Results from Granger Causality Tests: 1968:1-1986:4

<i>Step 1: Null Hypothesis: No Granger Causality from DTB86 to DBB86</i>				
Variable	SUM(COEFS)	STD Error	Joint-F	P-Value
DBB86	0.3084	0.200	2.67	0.055
DTB86	-0.0327	0.086	0.48	0.697
Conclusion: fail to reject the null hypothesis				
<i>Step 2: Null Hypothesis: No Granger Causality from DBB86 to DTB86</i>				
DTB86	0.71962	0.133	13.50	0.000
DBB86	-0.57052	0.310	2.36	0.080
Conclusion: fail to reject the null hypothesis				

A model of VAR(4), with variables of DBB03 and DTB03 in Table 2, is employed to test data for the period of 1987:1-2003:2 during which the exchange rates are determined

⁸ LR, SC, HQ result in lag one. The model of VAR(1) has the same conclusion as the model of VAR(3) but with worse results of the diagnosis tests.

under a market-oriented system. The lag length four is suggested by all the used criteria. The result is that DBB03 and DTB03 do not Granger cause each other. Table 7 shows the details of Granger causality tests.

Table 7. Results from Granger Causality Tests: 1987:1-2003:2

<i>Step 1: Null Hypothesis: No Granger Causality from DTB86 to DBB86</i>				
Variable	SUM(COEFS)	STD Error	Joint-F	P-Value
DBB03	-0.5187	0.213	6.41	0.000
DTB03	0.0158	0.244	0.301	0.876
Conclusion: fail to reject the null hypothesis				
<i>Step 2: Null Hypothesis: No Granger Causality from DBB86 to DTB86</i>				
DTB03	0.60291	0.163	9.19	0.000
DBB03	0.28927	0.142	1.68	0.170
Conclusion: fail to reject the null hypothesis				

If separating the data by the exchange rate regime into two periods, the results show that the first-order difference of budget balances and of trade balances do not Granger cause each other. Therefore, there is no support for the Keynesian proposition.

6.1.3 The Third Time Frame: 1989:1-2003:2

A model of VAR(4), with variables of DBB89 and DTB89 in Table 3, is employed to test data for the period of 1989:1-2003:2 during which the budget deficit has deteriorated. The lag length four is suggested by all the mentioned criteria. The result is that DBB89 and DTB89 do not Granger cause each other. Table 8 shows the results of Granger causality tests.

Table 8. Results from Granger Causality Tests: 1989:1-2003:2

<i>Step 1: Null Hypothesis: No Granger Causality from DTB89 to DBB89</i>				
Variable	SUM(COEFS)	STD Error	Joint-F	P-Value
DBB89	-0.6476	0.207	9.75	0.000
DTB89	-0.2497	0.241	0.544	0.704
Conclusion: fail to reject the null hypothesis				
<i>Step 2: Null Hypothesis: No Granger Causality from DBB89 to DTB89</i>				
DTB89	0.53469	0.203	5.61	0.001
DBB89	0.26321	0.175	1.81	0.146
Conclusion: fail to reject the null hypothesis				

A focus on the period of a deterioration of budget deficits ends a result which fails to support the Keynesian proposition.

To sum up, for the case of Taiwan, only the tests on the data of the whole period support the Keynesian proposition. Tests on separated data in different periods show no sign of supporting the Keynesian proposition. Therefore, the budget balance and the trade balance could be kin and could also be strangers. It depends on which period of data being investigated.

6.2 Tests for Ricardian Equivalence

This section conducts two tests. One is the test for the relationship between the excess of investment over private saving (I-S) and the budget balance (BB^A). This is justified directly from the national income accounting identities. The other is the test for the relationship between the private saving (S) and the budget balance. This is justified by the theory behind the Ricardian equivalence that only the private saving moves one-to-one to the change of the budget balance.

6.2.1 Test of Excess of Investment over Private Saving (I-S)

Since I-S is stationary and BB^A is I(1). Therefore, the first-order difference of BB^A is taken into consideration. A model of VAR (2) is employed due to the suggestion from most of the lag-order selection criteria⁹. The conclusion is that I-S and DBB^A do not Granger cause each other. Therefore, there is no support for the Ricardian equivalence. Table 9 presents the results of the Granger causality tests.

Table 9. Results from Granger Causality Tests of I-S and DBB^A : 1968-2002

<i>Step 1: Null Hypothesis: No Granger Causality from IS to DBB^A</i>				
Variable	SUM(COEFS)	STD Error	Joint-F	P-Value
DBB^A	-0.98637	0.347	7.44	0.003
I-S	-0.12515	0.0885	2.71	0.086
Conclusion: fail to reject the null hypothesis				
<i>Step 2: Null Hypothesis: No Granger Causality from DBB^A to IS</i>				
I-S	0.64067	0.144	16.1	0.000
DBB^A	-0.25777	0.567	0.405	0.671
Conclusion: fail to reject the null hypothesis				

6.2.2 Test of Private Saving (S)

A model of VAR(3) is used due to the suggestion from criteria of LR, FPE and AIC¹⁰. The conclusion is that DS precedes DBB^A but not the other way around. Therefore, the data do not support the Ricardian Equivalence. Table 10 shows the result.

⁹ LR, FPE, AIC and HQ suggest lag two.

¹⁰ SC and HQ suggest lag one. However, the model of VAR(1) has a worse result than the model of VAR(3) in terms of the diagnosis tests.

Table 10. Results from Granger Causality Tests of S and DBB^A : 1968-2002

<i>Step 1: Null Hypothesis: No Granger Causality from DS to DBB^A</i>				
Variable	SUM(COEFS)	STD Error	Joint-F	P-Value
DBB^A	-0.68804	0.581	7.57	0.001
DS	-0.20322	0.261	5.04	0.008
Conclusion: reject the null hypothesis				
<i>Step 2: Null Hypothesis: No Granger Causality from DBB^A to DS</i>				
DS	0.54639	0.322	1.96	0.150
DBB^A	-0.66659	0.717	2.84	0.061
Conclusion: fail to reject the null hypothesis				

Since DS precedes DBB^A , Table 11 provides the details of the VAR(3) model. A positive change of DS at lag three has a negative impact on DBB^A . The result shows that one dollar increase/decrease in DS results in a 60 cent decrease/increase in DBB^A . Given the current situation of Taiwan, a decrease of one dollar in private savings between period 0 and 1, an increase of 60 cents in the budget balance would be expected between period 3 and 4. This result implies a substitution between private savings and government surplus (or savings) but points to the opposite transition predicted by the Ricardian equivalence. To investigate this issue is beyond the scope of this paper.

Table 11. Results of the Model of VAR(3): DS and DBB^A

	DBB_{-1}^A	DBB_{-2}^A	DBB_{-3}^A	DS ₋₁	DS ₋₂	DS ₋₃	C
DBB_t^A	-0.783 (0.001)*	-0.004 (0.987)	0.10 (0.677)	0.147 (0.441)	0.250 (0.160)	-0.600 (0.002)*	-16567 (0.429)
DS _t	-0.128 (0.619)	-0.605 (0.075)	0.066 (0.822)	0.332 (0.167)	-0.201 (0.354)	0.415 (0.056)	31709 (0.224)

Note: 1. Numbers in parenthesis are the p-values.

2. * means the statistic is significant at 5% confidence interval.

3. C stands for the constant.

To sum up, for the case of Taiwan, the public do not respond to an increase in the government budget deficit by increasing their savings. They may not regard the current deficits as their future tax responsibilities. The data show that Taiwanese do not obey the life cycle hypothesis.

7. Conclusion

This paper takes the first step toward investigating the relationship between the budget balances and the trade balances for the case of Taiwan, a country which used to be regarded as an outstanding performer in its outward trading and a good controller in its government budgets. Since 1989, Taiwan has been experiencing a deterioration in its budget deficits and a fall in its trade surplus, with the exception of the years 2001 and 2002. Hence there is clearly a need to investigate the issue of 'twin deficits' based on the Keynesian proposition. Furthermore, this paper does not presume a failure of Keynesian proposition implies a hold of Ricardian equivalence. Therefore, the inference based on the Ricardian Equivalence is also tested.

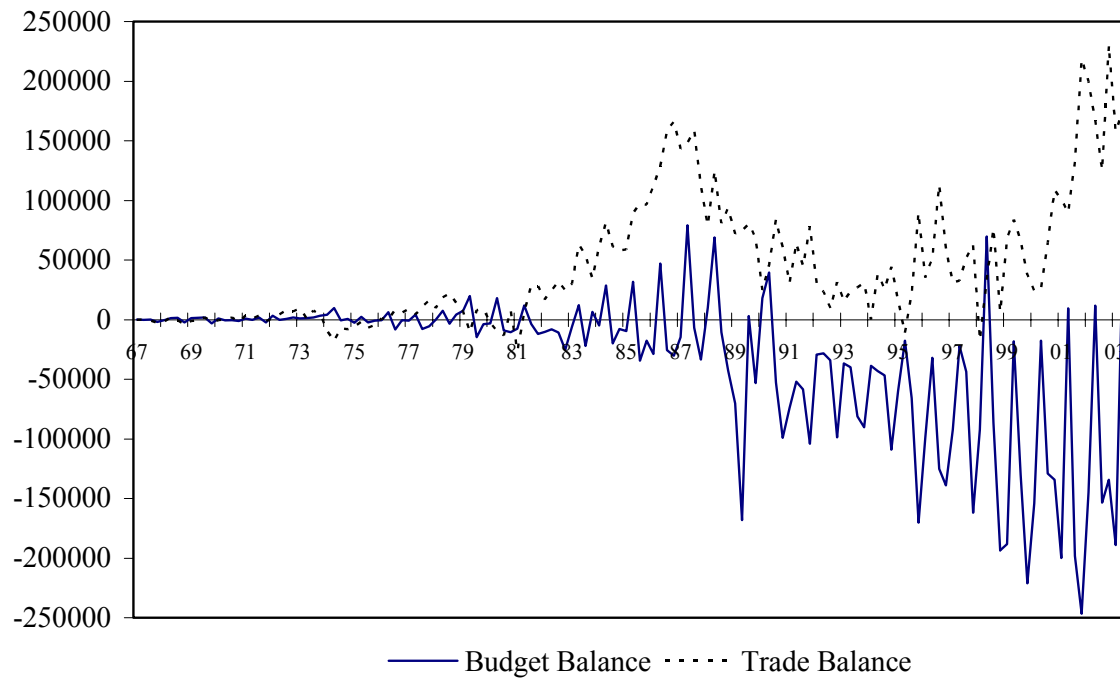
Unit root tests, cointegration tests, Granger causality tests and the VARs model are the main techniques used in this paper. To test the Keynesian proposition, three time frames are used, i.e. the whole period (1967:1-2003:2), two periods (1967:1-1986:4 and 1987:1-2003:2) separated by the exchange rates regime and the current period (1989:1-2003:2) starting with a deterioration of the budget deficit. To test the Ricardian equivalence, one time zone is used, 1967-2002, due to the data of private savings only available by per annum, so as the data of excess of investment over private savings. Two tests are

conducted. First, investigation falls on the relationship between the budget balances and the excess of investment over private savings, which is directly justified by the national income accounting identities. Second, investigation falls on the relationship between the budget balances and the private savings, which is justified by the theory of Ricardian equivalence.

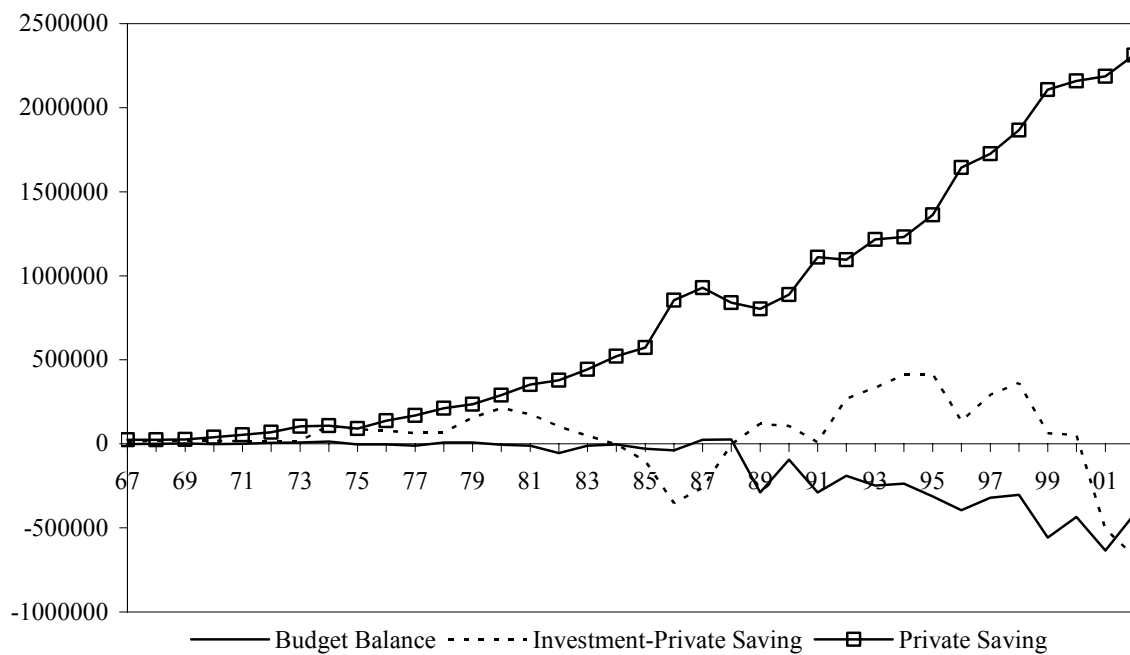
The main findings are that Keynesian proposition is supported by the model using data of the whole period but is not supported by other models using data from different sub-periods. This paper discloses the complexity of this issue than one could expect. The results imply that the budget balance and the trade balance being kin or strangers depends on the data in two aspects. First, the source of data, i.e. different country conducts different policies, hence provides different evidence. Second, the period of data. Which period is ideal for testing remains a decision of researcher and availability of data. In other words, the budget balance and the trade balance could be kin, could be strangers and could be something between. There is no support for the Ricardian equivalence for the case of Taiwan, i.e. Taiwanese do not regard the current budget deficits as their future tax responsibility. The data show that the public in Taiwan do not obey the life cycle hypothesis. An interesting finding is that a reduction in private savings can pass its positive impact to a future budget balance. A detailed discussion of this issue is beyond the scope of this paper and should be left for a future research.

Appendix 1

The Data (Quarterly; Unit: NT\$ million)



The Data (Annual; Unit: NT\$ million)



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