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ฐานะหนี้ต่างประเทศและดุลบัญชีเดินสะพัดที่สอดคล้องกับเสถียรภาพระยะยาว

External Debt Dynamics and Current Account Sustainability

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บทสรุป

ข้อคิดเห็นที่ปรากฏในบทความนี้เป็นความเห็นส่วนตัวของผู้เขียนโดยเฉพาะ ซึ่งไม่จำเป็นต้องสอดคล้องกับนโยบายของธนาคารแห่งประเทศไทย

บทความนี้ศึกษาการปรับตัวของหนี้ต่างประเทศและดุลบัญชีเดินสะพัดของไทยว่ามีความสอดคล้องกับเสถียรภาพระยะยาวหรือไม่ จากการศึกษาโดยใช้เครื่องชี้ความสามารถในการชำระหนี้ (Solvency Indicators) และเครื่องชี้สภาพคล่อง (Liquidity Indicators) พบว่าปัญหาเสถียรภาพด้านต่างประเทศมีมากขึ้นเป็นลำดับก่อนเกิดวิกฤตการณ์ทางเศรษฐกิจในปี 2540 อย่างไรก็ตาม เครื่องชี้เหล่านี้ได้ปรับตัวดีขึ้นเป็นอย่างมากหลังจากนั้น ส่วนการทดสอบทางเศรษฐมิติให้ผลสอดคล้องกัน กล่าวคือ การก่อหนี้ต่างประเทศในอดีตไม่สอดคล้องกับความสามารถในการชำระหนี้ของประเทศ

สำหรับการศึกษาดุลบัญชีเดินสะพัดที่สอดคล้องกับเสถียรภาพในระยะยาว (Steady State Current Account Deficits) พบว่าดุลบัญชีเดินสะพัดไม่ควรขาดดุลอย่างต่อเนื่องเกินร้อยละ 2.3 ถึง 3.3 ต่อ GDP ในส่วนของการคาดการณ์ระดับหนี้ต่างประเทศจากแบบจำลองที่สมมติให้การขาดดุลบัญชีเดินสะพัดทั้งหมดจะได้รับการชดเชยจากการก่อหนี้ต่างประเทศ พบว่าหนี้ต่างประเทศต่อ GDP มีแนวโน้มที่จะลดลงในระยะแรก แต่จะเริ่มเพิ่มขึ้นอีกครั้งในปี 2549-2550 จากการที่ดุลบัญชีเดินสะพัดเริ่มขาดดุล และจะมีแนวโน้มเพิ่มสูงอีกหลังจากนั้น ดังนั้นจึงจำเป็นต้องมีการดูแลไม่ให้ดุลบัญชีเดินสะพัดขาดดุลอย่างต่อเนื่องเกินเกณฑ์ข้างต้น ทั้งนี้เพื่อไม่ให้หนี้เพิ่มสูงมากในระยะต่อไป

บทสรุปผู้บริหาร

ฐานะหนี้ต่างประเทศและดุลบัญชีเดินสะพัดที่สอดคล้องกับเสถียรภาพระยะยาว

วิกฤตการณ์เศรษฐกิจในปี 2540 ก่อให้เกิดการตั้งประเด็นอย่างกว้างขวางเกี่ยวกับการดูแลดุลการชำระเงิน แนวทางการบริหารหนี้ต่างประเทศ และแนวทางการบริหารความเสี่ยงด้านสภาพคล่องทั้งของภาครัฐและภาคเอกชน แม้ว่าในปัจจุบันเสถียรภาพทางเศรษฐกิจได้ปรับตัวดีขึ้นมากในช่วงหลังวิกฤต โดยเฉพาะด้านต่างประเทศ ดุลบัญชีเดินสะพัดเกินดุล หนี้ต่างประเทศลดลงเป็นลำดับ ขณะที่ทุนสำรองทางการเพิ่มขึ้นเพียงพอที่จะชำระหนี้ระยะสั้น แต่เมื่อเศรษฐกิจฟื้นตัวชัดเจน ดุลบัญชีเดินสะพัดมีแนวโน้มที่จะกลับมาขาดดุล และอาจต้องอาศัยเงินทุนจากต่างประเทศเพิ่มขึ้นอีกครั้งในระยะยาว จากแนวโน้มดังกล่าวทำให้เกิดคำถามว่าระดับและการปรับตัวของหนี้ต่างประเทศและดุลบัญชีเดินสะพัดที่สอดคล้องกับเสถียรภาพในระยะยาวควรเป็นอย่างไร

เพื่อตอบคำถามนี้ งานวิจัยได้ศึกษาการปรับตัวของหนี้ต่างประเทศโดยเปรียบเทียบในช่วงก่อนและหลังวิกฤตเศรษฐกิจ และคำนวณหาเกณฑ์ดุลบัญชีเดินสะพัดที่จะสอดคล้องกับเสถียรภาพในระยะยาว พร้อมกับประเมินความสามารถในการชำระหนี้และความเสี่ยงด้านสภาพคล่องโดยใช้เครื่องชี้เสถียรภาพด้านต่างประเทศ ประมาณการแนวโน้มการปรับตัวของหนี้ต่างประเทศ รวมทั้งเสนอแนวนโยบายที่เกี่ยวข้องกับดุลบัญชีเดินสะพัดและการบริหารหนี้ต่างประเทศ

การศึกษาดุลบัญชีเดินสะพัดที่สอดคล้องกับเสถียรภาพระยะยาว พิจารณาจากความสามารถในการสร้างรายได้ และความจำเป็นในการรักษาสภาพคล่องของประเทศ โดยมีปัจจัยสำคัญที่กำหนดความสามารถในการสร้างรายได้ คือ การขยายตัวของ GDP การขยายตัวของผลิตภาพ และการขยายตัวของการลงทุนโดยตรงจากประเทศ ส่วนปัจจัยสำคัญที่สะท้อนความจำเป็นในการรักษาสภาพคล่องของประเทศ คือ สัดส่วนเงินสำรองระหว่างประเทศต่อการนำเข้า หรือ สัดส่วนเงินสำรองระหว่างประเทศต่อหนี้ต่างประเทศระยะสั้น ผลการศึกษาพบว่าดุลบัญชีเดินสะพัดไม่ควรขาดดุลอย่างต่อเนื่องเกินร้อยละ 2.3 ถึง 3.3 ต่อ GDP.

การประเมินความสามารถในการชำระหนี้ต่างประเทศและความเสี่ยงด้านสภาพคล่อง ประกอบด้วยการพิจารณาฐานะทางการเงินที่มั่นคง (Solvency) โดยใช้สัดส่วนหนี้ต่างประเทศต่อ GDP และสัดส่วนหนี้ต่างประเทศต่อมูลค่าการส่งออกสินค้าและบริการ เป็นเครื่องชี้ และสภาพคล่อง (Liquidity) โดยใช้ สัดส่วนทุนสำรองระหว่างประเทศต่อมูลค่าสินค้าเข้าต่อเดือน และสัดส่วนทุนสำรองระหว่างประเทศต่อหนี้ต่างประเทศระยะสั้นตามอายุที่เหลือเป็นเครื่องชี้ พบว่าฐานะความมั่นคงทางการเงิน และสภาพคล่องของประเทศปรับตัวดีขึ้นมากในช่วงหลังวิกฤตเศรษฐกิจ โดยสัดส่วนหนี้ต่างประเทศต่อ GDP และสัดส่วนหนี้ต่างประเทศต่อมูลค่าการส่งออกสินค้าและบริการในไตรมาสแรกของปี 2545

อยู่ที่ร้อยละ 59.7 และร้อยละ 92.7 ตามลำดับ ขณะเดียวกัน สัดส่วนทุนสำรองระหว่างประเทศอยู่ที่ระดับ 7.5 เดือนของมูลค่าสินค้าเข้า และสัดส่วนทุนสำรองระหว่างประเทศต่อหนี้ต่างประเทศระยะสั้นตามอายุที่เหลืออยู่ที่ระดับร้อยละ 1.6 ซึ่งเครื่องชี้ส่วนใหญ่ดีกว่าเกณฑ์มาตรฐานสากล

การศึกษาทางเศรษฐมิติโดยใช้ Unit Roots ทดสอบการเปลี่ยนแปลงของหนี้ต่างประเทศในอดีต พบว่าไม่สอดคล้องกับความสามารถในการชำระหนี้ในระยะยาว ส่วนของการทดสอบโดยใช้ Cointegration Test ระหว่างรายรับที่เป็นเงินตราต่างประเทศรวมกับเงินสำรองระหว่างประเทศ กับรายจ่ายที่เป็นเงินตราต่างประเทศไม่พบความสัมพันธ์ที่ชัดเจนว่าทั้งสองรายการเปลี่ยนแปลงอย่างสอดคล้องกัน

ในส่วนของการคาดการณ์ระดับหนี้ต่างประเทศจากแบบจำลอง Debt Dynamics ที่สมมติให้เศรษฐกิจขยายตัว output gap ลดลง ทำให้ดุลบัญชีเดินสะพัดเกินดุลลดลงและขาดดุลในที่สุด โดยที่การขาดดุลบัญชีเดินสะพัดทั้งหมดจะได้รับการชดเชยจากการก่อหนี้ต่างประเทศ พบว่าหนี้ต่างประเทศต่อ GDP มีแนวโน้มที่จะลดลงในระยะแรก และจะปรับตัวสูงขึ้นในระยะถัดไปจากการที่ดุลบัญชีเดินสะพัดเริ่มขาดดุลเพิ่มขึ้น สำหรับสัดส่วนหนี้ต่างประเทศต่อการส่งออกให้ผลให้ทิศทางเดียวกันแต่จะเพิ่มสูงขึ้นช้ากว่าสัดส่วนหนี้ต่างประเทศต่อ GDP

สำหรับข้อเสนอแนะทางนโยบายมี ดังนี้ ทางการควรมีการดูแลดุลบัญชีเดินสะพัดไม่ให้ขาดดุลเกินระดับที่สอดคล้องกับเสถียรภาพระยะยาวอย่างต่อเนื่อง ควรมีนโยบายส่งเสริมการออม เพิ่มประสิทธิภาพการลงทุน รวมทั้งรักษาวินัยทางการคลัง เพื่อช่วยลดช่องว่างระหว่างการออมและการลงทุนในประเทศ นอกจากนั้นยังควรเพิ่มความสามารถในการแข่งขันระหว่างประเทศ และการพัฒนาเทคโนโลยีทางด้านการดูแลสภาพคล่อง ทางการควรดูแลให้มีเงินสำรองอยู่ในระดับที่เหมาะสมสอดคล้องกับฐานะหนี้ต่างประเทศ โดยทางการควรหาช่องทางขยาย credit lines เพื่อเพิ่มวงเงินเสริมสภาพคล่องในกรณีฉุกเฉิน ตลอดจนส่งเสริมเงินทุนโดยตรงจากต่างประเทศระยะยาว อีกทั้งควรมีระบบการติดตามและเผยแพร่ข้อมูลที่รวดเร็วและโปร่งใสโดยเฉพาะอย่างยิ่งข้อมูลเกี่ยวกับการกู้ยืมเงินระหว่างประเทศ

I. Introduction

In the 1970s and the 1980s Thailand's external debt was not exceedingly high relative to GDP; however, in the early 1990s it increased significantly as a reflection of persistently high current account imbalances. The debt-to-GDP ratio rose from less than 40 percent during 1990-1993 to more than 60 percent during the period of 1995-1996, while the average ratio of developing countries was at 35 percent in 1996 (BIS, 2000). Like other developing countries, as the economy grew, Thailand had to rely on foreign capital to finance the gap between domestic savings and investment. Nevertheless, high current account deficits, and the resulting high external indebtedness were considered excessive compared to the growth path of the economy, which eventually led to the economic crisis in 1997.

The objective of this paper is to examine the sustainability of Thailand's current account deficits and external debt in the past as well as to evaluate if they would be sustainable in the future. There is no single criterion for determining if the current account deficits and external debt are consistent with the long-term economic growth. Therefore, the paper will employ different methods including comparative indicators, econometric tests, and an analytical framework with calibration.

The paper is organized as follows. Section II gives the overview of Thailand's external sector, particularly the current account, the external debt structure and their evolutions before and after the crisis in 1997. Related literature will be reviewed in section III. Section IV discusses external indicators. Section V presents the analytical framework. Section VI discusses the empirical results and provides the assessment of future sustainability. Section VII provides concluding remarks and policy recommendations.

II. Evolution of the External Debt and Current Account

2.1 Current Account

In the 1970s and the 1980s Thailand's current account deficits, as a percentage of GDP, averaged at 3.6 percent. However, the current account deficits had undergone a substantial change since 1993 following the introduction of Bangkok International Banking Facility (BIBFs). The current account deficits rose steadily from 5.1 percent in 1993 to 7.8 percent in 1996, averaging at 6.8 percent during 1990-1996. After the economic crisis, it became highly positive at 12.8 percent of GDP in 1998 as exports grew more slowly and imports drastically declined. However, as the economy gradually recovered, the current account surplus declined to 5.5 percent of GDP in 2001 as import increased faster than exports (see figure 1).

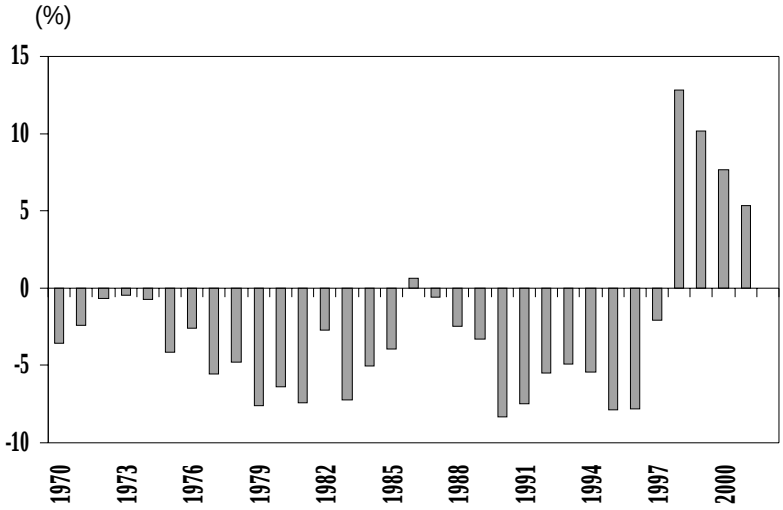

Figure 1. Current Account-to-GDP Ratio, 1970-2001

2.2 External Debt

Corresponding with rising current account deficits, after the financial liberalization initially started in 1990, capital inflows into Thailand increased markedly. Net capital account inflows rose from US$ 9.7 billion in 1990 to US$ 21.9 billion in 1995. The majority was in the form of debt creating inflows, leading to a huge accumulation of external debt during that period. It can be noticed that from 1970, cumulative current account deficits have grown in the same direction and with similar magnitude as gross external debt subtracted by gross foreign reserves (see figure 2).

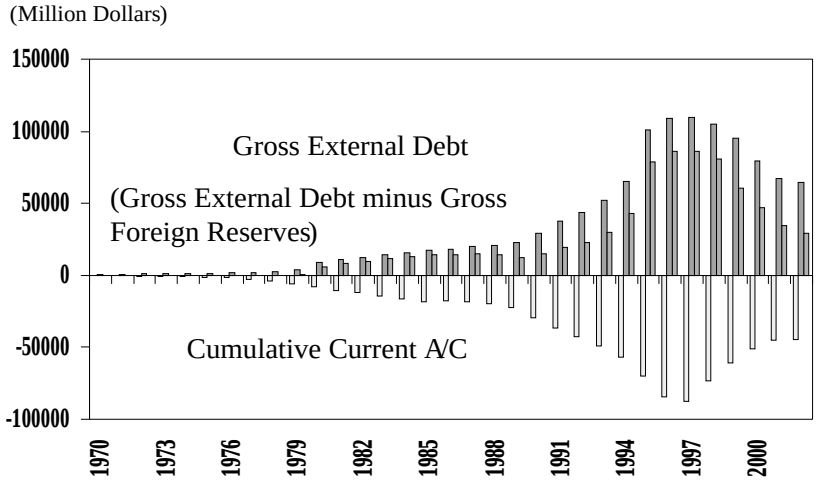

Figure 2. Cumulative Current Account Deficit and External Debt Outstanding, 1970-2002

As for the structure of the external liabilities, this paper takes a look at classification by sector, maturity, currency denomination, interest rate structure and creditors. These are crucial determinants of the country's ability to withstand shocks.

External vulnerability had increased after Thailand started to liberalize its capital account in the early 1990s. The corollary of this feature was a fast accumulation of private external debt through commercial bank's borrowings, BIBFs borrowings as well as direct borrowings to take advantage of lower interest rates abroad. By 1995, about 42 percent of total debts were those of the banking sector's, compared with the ratio of about 12 percent in 1991. The borrowings of commercial banks and BIBFs were mostly short-term in nature. They declined sharply after the crisis due to higher credit risk and lower demand for capital. As for the non-bank sector, since the outbreak of the crisis, it's debt outstanding has also declined markedly in line with debt repayments.[1] Other factors contributing to this decline in external debt outstanding include proceeding debt restructuring, higher exchange rate volatility, high liquidity and low interest rate in the domestic market.

Table 1. External Debt Classified by Sector

Billions of US$	**1995**	**1997**	**1999**	**2001**	**2002***
1. Public sector	**16.4**	**24.1**	**36.2**	**28.3**	**27.1**
1.1 Government	4.9	6.0	8.9	8.7	8.6
1.2 State Ent.	11.5	10.9	14.5	11.3	11.2
1.3 BOT	0.0	7.2	12.8	8.3	7.3
2. Private sector	**84.4**	**85.2**	**58.8**	**39.2**	**37.6**
2.1 Bank sector	41.9	39.2	17.7	9.4	9.0
2.2 Non-bank	42.5	46.0	41.1	29.8	28.6
Total	**100.8**	**109.3**	**95.1**	**67.5**	**64.7**

Note: * As of April 2002
Source: Bank of Thailand

On the other hand, public borrowing became more prominent after the crisis. Before that, low borrowing coincided with persistent fiscal surplus. Government borrowing during that time largely belonged to state enterprises as the government itself had access to lower cost of funds. With the borrowing ceiling at 10 percent of the government budget, the government borrowed from abroad around 80 percent of the ceiling during 1987 and 1996. This foreign borrowing option has been limited in recent years as there exist concerns about possible high debt burden regarding the Bank of Thailand's (BOT) debt and delays of some

[1] During 1997- April 2002, the non-bank private sector already paid their external debt by US$ 17.4 billions (including a valuation change). As a result, the non-bank private debt outstanding stood at US$ 28.6 billions.

project loans.[2] Currently, the government external debt accounts for approximately 22 percent of total government debt (including the FIDF's).[3]

Table 2. shows the maturity profile of external debt. Short-term external debt to total external debt had considerably large in the year leading to crisis. This, in part, was due to the intermediation of the banking sector, particularly the BIBFs. Most of the borrowings through the BIBFs were short-term. Moreover, some of the long-term debts were subject to put options, rendering them effectively short-term.[4] The BOT's external debt survey showed that in March 1998 US$ 2.4 billion of the long-term private non-bank sector's external debt was in the form of put options. This amount, however, fell to a mere US$ 9 million in March 2002. The higher the short-term debt ratio is, the more vulnerable the economy is, particularly when short-term liabilities were not matched by foreign assets of similar characteristics. As many observers argued, this maturity mismatch was one of the crucial factors indicating financial fragility as witnessed during the crisis.

Table 2. External Debt Classified by Maturity

% of Total Debt	**1995**	**1997**	**1999**	**2001**	**2002**
1. Original					
Long-term	48.0	65.0	79.1	80.2	79.7*****
Short-term	52.0	35.0	20.9	19.8	20.3*****
2. Remaining					
Long-term	n.a.	56.8	70.2	68.8	68.3**
Short-term	n.a.	43.2	29.8	31.2	31.7**
Total	n.a.	100.0	100.0	100.0	100.0

Note: * As of April 2002.

** As of first quarter 2002

Source: Bank of Thailand.

However, the maturity profile has changed dramatically following the crisis; this was mainly due to debt repayments of the private sector and an

[2] The government borrowed US$ 4.3 in 1998, US$ 3.7 billions in 1999, but nil in 2000, and only US$ 300 millions in 2001. In 2002, the government set a ceiling at only US$1.0 billion.

[3] The share will increase to around 30 percent, if the public enterprise debt is included. As for fiscal sustainability analysis, see Chensavasdijai and *et al* (2002). As the BOT's debt is expected to vanish by 2005, the government has more room to increase its external financing.

[4] The recent estimates suggested that more than US$ 30-40 billion in outstanding emerging market debt instruments have put options attached to them (BIS, 2000).

increase in long-term borrowings by the public sector. It is important to note that the maturity profile has been roughly the same since 1999 due to amble liquidity in the domestic market coupled with the appreciation of the baht[5] As of the first quarter of 2002, short-term external debt by remaining maturity of the government and state enterprises accounted for only 10 percent of their total debt. While the banking sector holds approximately the same proportion between short term and long term debt, most of the non-bank private sector debts are long term. Non-bank average original maturity is 8 years and 2 months and the average remaining maturity has been shortened. On the other hand, the average maturity of government debt is 19 years.[6]

Since the crisis, foreign currency exposure has declined despite high concentration ratios in the US Dollar and the Japanese Yen. The US dollar denominated debt still has the largest share, approximately 60 percent of total debt, even though it has been decreasing. On the other hand, the Yen-denominated debt, particularly debt of public enterprises, has gained more importance. The banking sector borrows equally in Yen and US Dollar, while the non-banking sector borrows mainly in US dollars. An increase in Yen borrowings by the banking sector has been observed since the crisis due to low interest rates. It should be noted that foreign currency debt has been increasingly hedged.[7] This makes the external debt position less susceptible to fluctuations in the foreign exchange market.

Table 3. External Debt Classified by Currency

% of Total Debt	1995	1997	1999	2001	2002:Q1
US$	77.9	73.9	58.4	59.2	58.0
Yen	17.1	20.8	33.5	31.2	32.1
SDR	0.0	2.2	3.6	2.5	2.0
DM	1.8	1.0	1.1	1.0	0.9
GBP	1.0	0.4	0.4	0.5	0.5
CHF	1.0	0.7	0.5	0.5	0.5
Others	1.2	1.0	2.6	5.1	6.0
Total	100.0	100.0	100.0	100.0	100.0

Source: Bank of Thailand.

[5] Debt prepayments stood at US$ 5.6 billion in 1999, US$ 5.8 billion in 2000 and US$ 3.5 billion in 2001.

[6] Greenspan (1999) suggested a benchmark of more than three years and that the scheduled repayments should also be evenly distributed over time.

[7] As of end 2001, around 40 percent of corporate external debt-service payment was financially hedged and it is estimated that more than 25 percent were natural hedges.

As for the interest rate structure, the share of fixed interest rate debts is relatively high. Such structure makes the debt burden less vulnerable to the changing world interest rates. However, floating rate debts was tended to increase due mainly to the increase in government borrowings. As some non-bank private sector debtors have undergone debt restructuring and refinancing, the interest rate structure is likely to change over time. The London Inter Bank Offered Rate (Libor) based floating rate accounts for the largest share of private external debt, followed by the Singapore Inter Bank Offered Rate (Sibor) based floating rate as most borrowings were from Japan, Singapore and the United States.

Table 4. External Debt Classified by Interest Rate

%	1999	2000	2001	2002*
Total	100.0	100.0	100.0	100.0
Fixed	*53.1*	*57.6*	*57.3*	*55.2*
Float	*38.9*	*34.4*	*34.5*	*35.9*
*Others***	*8.0*	*8.0*	*8.2*	*8.9*
Public sector (excl. BOT)	100.0	100.0	100.0	100.0
Fixed	*67.7*	*69.2*	*64.6*	*64.2*
Float	*32.3*	*30.8*	*35.4*	*35.8*
Private sector	100.0	100.0	100.0	100.0
Fixed	*37.1*	*40.9*	*44.5*	*41.9*
Float	*50.0*	*45.1*	*41.4*	*43.0*
*Others***	*12.9*	*14.0*	*14.1*	*16.0*

Note: * As of first quarter

** Including other debt, non-interest and trade credit.

Source: Bank of Thailand

III. Literature Review of Current Account Sustainability and Debt Dynamics

In the literature, current account as well as external debt sustainability are commonly defined to be a situation in which a country is expected to be able to continue servicing its debts without having to drastically correct its income and expenditure paths at some point in the future. Hence, sustainability implies that the country will not accumulate debt faster than its ability to service its old debt, retreat to debt service retrenchment, and require debt restructuring in the future. It consists of two important concepts: solvency and liquidity. A country is solvent if the present discounted value of its current and future expenditure is not higher than the present value of its current account and future path of income, net of any initial indebtedness. On the other hand, a country

does not have a liquidity problem as long as liquid assets and available financing are sufficient to service or rollover its maturing liabilities.

Current account sustainability is a difficult concept to measure. Ex ante solvency is widely used as the most relevant criterion in assessing the long run feasibility of current account imbalances. The economy is deemed to be solvent if the net present value of its future current account surplus is at least equal to the current value of its external debt. Using panel data analysis, Williamson and Mahar (1998) concluded that, assuming a 3-percent-world inflation and 5 percent GDP growth, current account deficits between 2 to 3 percent of GDP are considered sustainable. If the GDP grows by 7-8 percent, sustainable current account deficits would be around 3-4 percent of GDP. The current account deficits of 5 percent or more of GDP have traditionally been viewed as a warning sign of unsustainable policies (Milesi-Ferretti and Razin, 1996, 1998). Reisen (1997) considered an economy in the steady state where current account deficits together with the accumulation of international reserves were equal to the economy's liabilities to GDP that foreigners were willing to hold in proportion to the country's long run GDP growth. For Thailand, the sustainable current account deficit in the steady state was found to be at 2.8 percent of GDP.

Using the co-integration test for intertemporal borrowing constraints during 1955-1990, Sawada (1994) found that Thailand's outstanding external debt was sustainable. However, using a similar framework, Ostry (1997) concluded that the path of Thailand's current account during the late 1980s to the early 1990s was not sustainable. Supanit (2001) also discovered that the ratio of short-term debt to total debt was unsustainable during 1997-1998. Much of the increase in external debt over the 1990s resulted from a pronounced rise in short-term borrowing. [8]

IV. Indicator Analysis

This section discusses two main types of external sustainability indicators: solvency indicators and liquidity indicators.

4.1 Solvency or Creditworthiness Indicators

Three solvency indicators are examined in this section. They are the current account deficit-to-GDP, external debt-to-GDP and external debt-to-export ratio.

4.1.2 Current Account Deficit-to-GDP Ratio

Adopting the earlier concept proposed by Reisen (1997), the steady state current account deficits for Thailand was recalculated with an additional adjustment for foreign direct investment (FDI) and short-term debt. The FDI should help reduce the possibility of future balance of payments crisis as it is

[8] The optimal short-term debt to total debt ratios were estimated to be less than 20.25 % in 1997 and 25.29% in 1998, whereas the actual ratios were 35.04% and 27.06%, respectively (Supanit, 2001).

largely determined by non-cyclical considerations and produces positive external spillovers.

Consider an economy in the steady state where *d* denotes liabilities as a fraction of the country's GDP that foreigners are willing to hold in equilibrium which is proportional to the long run GDP growth, *g*. In equilibrium, this long run proportion of net liabilities to GDP the country accumulates has to equal the current account deficit-to-GDP (CAD) plus the net accumulation of foreign reserves FX-to- GDP.

$$CAD + \Delta FX = g * d \qquad \text{(I)}$$

As the economy grows in the long term, the desired levels of foreign reserves would rise due to increasing demand for imports and variability in other components of the balance of payments. Let *im* denote real annual import growth, the change in the desired reserve ratio can be expressed as follows:

$$\Delta FX = [(1+im)/(1+g)]FX - FX \qquad \text{(II)}$$

Substituting II into I gives

$$g * d = CAD + [(im-g)/(1+g)]FX \qquad \text{(III)}$$

In addition, the long run GDP growth also indirectly affects debt dynamics through the Balassa-Samuelson effect. That is, productivity differentials between traded and non-traded goods in the domestic market and foreign markets will influence long run GDP growth and real exchange rate appreciation. The growth of real exchange rate appreciation relative to GDP growth, denoted by ε, would reduce the debt-to-GDP ratio. Moreover, the need to hold foreign reserves as a fraction of GDP would be reduced as the real exchange rate appreciation would reduce current account imbalances.

Furthermore, as FDI is a long-term component of current account deficit financing and would create positive spillovers to GDP, the growth of FDI compared with GDP growth, denoted by τ, should also help reduce debt-to-GDP and foreign reserves-to-GDP ratios. The inclusion of ε and τ in (III) would yield the following equation.

$$(g+\varepsilon+\tau) * d = CAD + [(im+\varepsilon+\tau-g)/(1+g)]FX \qquad \text{(IV)}$$

or

$$CAD = (g+\varepsilon+\tau) * d - [(im+\varepsilon+\tau-g)/(1+g)]FX \qquad \text{(V)}$$

The current account deficit in the steady state can be calibrated using equation (V). The first term on the right hand side shows that the country can allow for more current account deficits as the country's GDP, relative productivity, and FDI relative to GDP grow. On the other hand, the second term on the right hand side captures the country's need to accumulate more foreign reserves, which would reduce the ability to allow for current account deficits.

However, the past crisis experience has highlighted the importance of liquidity problems. Other than maintaining the foreign reserves for import payments, the country needs to have sufficient foreign reserves to pay for possible unexpected outflows of short-term capital. The foreign reserves need to rise when short-term debt increases in order to maintain the external liquidity condition. Let *sd* denote annual short-term debt growth. Replacing *im* in equation (V) by *sd* would yield the following equation.

$$CAD = (g + \varepsilon + \tau) * d - [(sd + \varepsilon + \tau - g)/(1 + g)]FX \qquad \text{(VI)}$$

Here both equation (V) and (VI) are used to find the steady state current account deficits. The results from these two equations would then be compared and the one with the lower deficit value would be the maximum current account deficit the country can afford to have in the long term. The parameters used for calibration came from various ways of calculation. First, the parameters summarized in table 5 were used. With these figures, the current account deficit in the steady state for Thailand is equal to 3.3 and 4.4 percent of GDP according to equations (V) and (VI) respectively.

Table 5 Parameters for Sustainable Current Account Deficit Calibration

Parameter	Value	Source
g	6.5%	Average growth from the trend using Hodrick-Prescott filter for 1970-2001
ε	1%	Reisen (1997)
τ	2%	OLS of log (FDI) on log (real domestic GDP) (sample 1970-2001)
im	7.05%	Average growth from the trend using Hodrick-Prescott filter for 1970-2001
sd	5.92%	Average growth from the trend using Hodrick-Prescott filter for 1982-2001
d	50	Reisen (1997)
FX for (V)	18.2	Average of six months of imports/GDP (1982- 2001)
FX for (VI)	6.97	Average of short-term debt/GDP(1982-2001)[9]

However, in the medium term, the potential GDP growth is likely to be below the average growth during 1970 and 2001, which includes the economic

[9] As the foreign reserves to short-term debt ratio needs be at least one as mentioned in Section IV, the short term foreign reserves- to GDP needs to be at least equal to the short-term- debt- to GDP ratio.

bubble periods. In addition, the competition for Foreign Direct Investments (FDIs) with other Asian countries, particularly China, should reduce FDI into Thailand. The calculation using the lower long term GDP growth rate of 5.5 percent per year and the lower FDI growth rate of 1 percent per year were also performed. With this alteration, the steady state current account deficit is 2.3 and 3.4 percent of GDP for Equations (V) and (VI) correspondingly. As the former is lower than the latter, the former would be used. Therefore, using the results from the calculations with and without concerns about the potential GDP growth and the FDI competition, the current account deficits in the steady state should be in the range of 2.3 to 3.3 percent of GDP. The current account deficits are considered unsustainable when they are persistently greater than the numbers in the above range. Therefore, using this range, the current account deficits were not sustainable between 1990 and 1997.

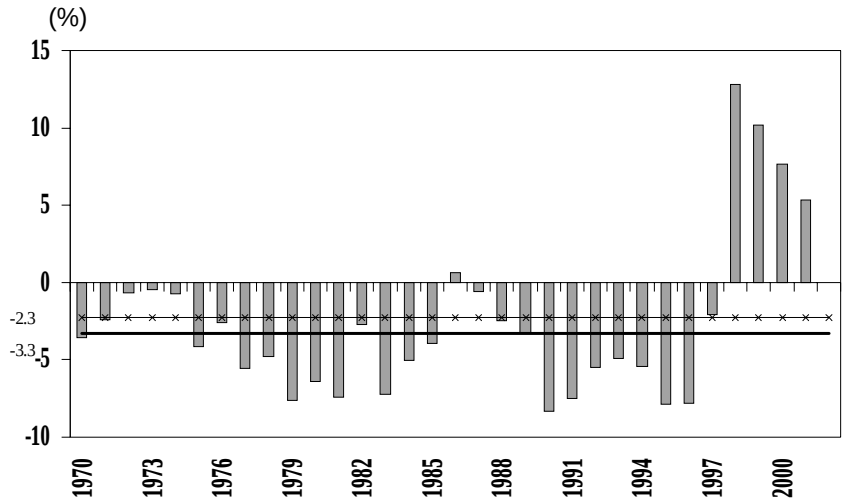

Figure 3. Sustainable Current Account Balance

4.1.2 External Debt-to-GDP ratio

The external debt-to GDP ratio showed an increasing trend over most of the covered periods. It increased from approximately 12 percent in the late 1960s, to 16 percent in the 1970s, to 36 percent in 1980s and to 55 percent in 1990s. After being stable over the period 1987 to 1992, the debt-to-GDP ratio resurged sharply to reach the peak of 93.2 percent in 1998. This large increase contributed to the emergence of an external crisis in 1997. Meanwhile, this ratio was corrected to 58.8 percent in 2001 along the lines of exchange rate stabilization, current account improvement, and real interest rate reduction. (See figure 4).

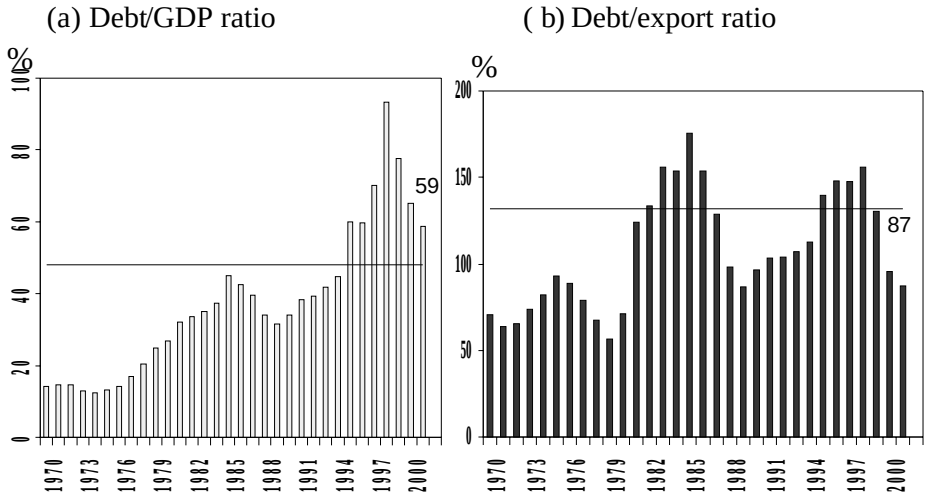

Figure 4. Solvency Indicators

The standard creditworthiness analysis typically uses maximum sustainable debt-to-GDP or debt-to-export ratios.[10] The rules of thumb for dangerous levels of debt are 40 percent of GDP and 200 percent of exports. With the debt-to-GDP ratio below the above level, the conditional probability of the debt crisis is around 2-5 percent and would rise to 15-20 percent when the ratio reaches its benchmark (Lane and Ghosh, 2002). Similarly, the World Bank's debt reduction initiative for highly indebted poor countries (HIPC) sets limits of less than 132 percent for the ratio of net present value of foreign debt to exports and 48 percent of the ratio of net present value of foreign debt to GNP as less indebtedness countries.

From the above criteria, there were 2 episodes in which external debt exceeded 40 percent of GDP. Those were during 1985-1986 following the baht devaluation in 1984 and during 1993-2001 after the financial liberalization in 1992. However, the pressure on insolvency tends to decline as the private sector and the Bank of Thailand continues to repay their debts.

4.2 Liquidity Indicators

Conventionally, reserve adequacy measured by months of imports is a widely used liquidity indicator. The useful rule of thumb is three months of imports. Nonetheless, this ratio may not be an appropriate indicator if the country is subject to high capital movements. This indicator did not demonstrate liquidity problems in the past. A more suitable indicator would be a ratio of international reserves to short-term external debt, which reflects a country's ability to withstand

[10] Williamson and Mahar (1998) argued that debt-to-GDP ratio may be considered a more appropriate long-term criterion because the adjustment policies can transform domestic output into exports.

the withdrawals of short-term capital. This rule would also be a good predictor of debt crisis (Detragiache and Spilimbergo, 2001).

Figure 5 shows that this ratio has remained above unity since the second quarter of 1999, meaning that short-term capital was fully backed by international reserves. However, the ratio would be smaller when using "net" international reserves instead of gross international reserves.[11] Nevertheless, compared with pre-crisis levels, this ratio has increased significantly due in part to an increase in foreign reserves. This indicates that Thailand has enough external liquidity to service its short-term debt over the next 12 months.

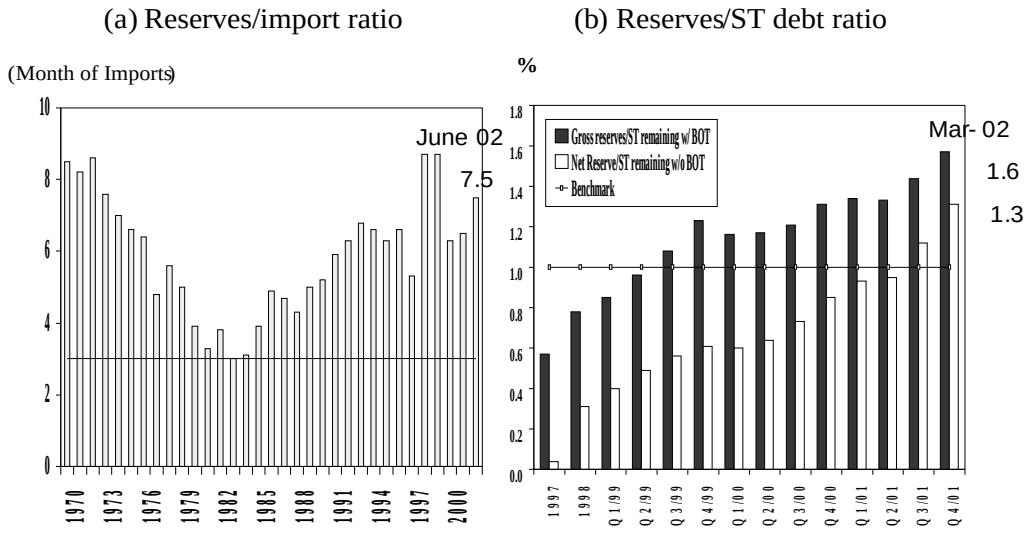

Figure 5. Liquidity Indicators

V. Analytical Framework for Debt Dynamics

In a discrete time framework, the balance of payments identity shows that external debt outstanding in the next period is equal to external debt outstanding in the present period less the current account. In this paper, the current account deficit is assumed to be financed solely by foreign borrowing.

$$D_{t+1} = D_t - CA_t \qquad (1)$$

Where D_t is the value of net external debt, and CA_t is the current account. From (1), adding and subtracting net interest payments on the right hand side yields the following equation.

$$D_{t+1} = (1 + r_t)D_t - CA_{no\,int\,t} \qquad (2)$$

Where r is the interest rate, and CA_{nointt} is the balance of goods and services without net interest payments (or non-interest current account). Dividing

[11] In June 1997, crisis-hit countries had an average level of international reserves equivalent to 3.8 months of imports and the ratio of reserves-to-short-term debt at 66 percent.

both sides by Y_t, the nominal GDP, and g is the growth rate of GDP ($(Y_{t+1} - Y_t)/Y_t$), we obtain:

$$(1+g)d_{t+1} = (1+r_t)d_t - ca_{no\,int\,t} \qquad (3)$$

Where the small letters represent their proportions to GDP and g_t is the growth rate of GDP.

The notion that debt sustainability is a situation in which a borrower is expected to be able to continue servicing its debt without an unrealistically large future correction to the balance of income and expenditure is difficult to apply operationally.[12] A more operational definition would be that a current account position is deemed sustainable if the economy does not violate its intertemporal solvency constraint. This study adopts this alternative approach proposed by Milesi-Ferretti and Razin (1996) and Ostry (1997) which focuses on the solvency element of sustainability.

Three main approaches in this section are employed. The first approach is to test external debt sustainability using unit root and co-integration tests. The last two approaches attempt to find the sustainable paths of debt-to-GDP and debt-to-export ratios, respectively.

5.1 The Intertemporal Model in an Open Economy

Hamilton and Flavin (1986), Jayme (2001), Sawada (1994), and Wilcox (1989) derived a feasible estimation equation based on the basic accounting identity for an open economy during period t:

$$Y_t + (D'_t - D'_{t-1}) + TR_t = A_t + r_t D'_t + \Delta RE_t \qquad (4)$$

Where D'_t is the net external debt (gross external debt minus foreign reserves), TR_t is the net transfer receipts, A_t is the domestic absorption, and ΔRE_t is the change in reserves.

From the income identity,

$$X_t - M_t = Y_t - A_t \qquad (5)$$

From (4) and (5), the trade balance is the following.

$$TB_t = X_t - M_t = r_t D_t - (D_t - D_{t-1}) - TR_t + \Delta RE_t \qquad (6)$$

The evolution of external debt is as follows:

$$(D'_t - D'_{t-1}) = r_t D'_{t-1} - S_t \qquad (7)$$

Where $S_t = (TB_t + TR_t - \Delta RE_t)$, which can be interpreted as the net external surplus that can be used to meet external debt repayments. Since (7) is a difference equation, it can be solved recursively to get the forward-looking solution in terms of the net external debt (D_t):

[12] See for example, Lane and Ghosh (2002), Milesi-Ferretti and Razin (1996) and Ostry (1997).

$$D'_t = \lim_{N\to\infty} \frac{D'_N}{\prod_{j=1}^{N-t}(1+r_{t+j})} + \sum_{j=t+1}^{\infty} \frac{S_j}{\prod_{i=1}^{j-t}(1+r_{t+i})} \qquad (8)$$

Under the rational expectation hypothesis, we can rewrite (8) by taking the expectation operator as follows:

$$D'_t = \mathrm{E}_t \lim_{N\to\infty} \frac{D'_N}{\prod_{j=1}^{N-t}(1+r_{t+j})} + \mathrm{E}_t \sum_{j=t+1}^{\infty} \frac{S_j}{\prod_{i=1}^{j-t}(1+r_{t+i})} \qquad (9)$$

The solvency condition is satisfied when:

$$D'_t = \mathrm{E}_t \sum_{j=t+1}^{\infty} \frac{S_j}{\prod_{i=1}^{j-t}(1+r_{t+i})} \qquad (10)$$

or

$$\mathrm{E}_t \lim_{N\to\infty} \frac{D'_N}{\prod_{j=1}^{N-t}(1+r_{t+j})} = 0 \qquad (11)$$

This is the so-called no Ponzi condition, which states that external debt cannot be incurred indefinitely into the future. If equation (11) is greater than zero, this means that the country can either roll over forever or bubbly finance its external debt (Sawada, 1989). In such a case, external debt would be unsustainable in the long run.

In order to test for sustainability according to the above setting, unit root and co-integration tests would be employed. We adopt an alternative equation proposed by Hakkio and Rush (1991) to derive a testable equation. Sawada (1989) applied this methodology to evaluate the sustainability of the external deficits of the HICs and some of the Asian countries, while Jayme (2001) used it to examine the case of Brazil. Assuming that the interest rate is stationary with an unconditional mean equal to *r*. Subtract rD'_{t-1} from both sides of Equation (7), we obtain:

$$E_t + (1+r)D'_{t-1} = EX_t + D'_t \qquad (12)$$

Where $EX_t = X_t + TR_t + RE_{t-1}$, $IM_t = M_t + RE_t$ and $E_t = IM_t + (r_t - r)D_{t-1}$. After taking the first difference, the following equation showing the change of net external debt is obtained.

$$\Delta D'_t = \Delta E_t + (1+r)\Delta D'_{t-1} - \Delta EX_t \qquad (13)$$

Solving this equation forward and substituting them into equation, $\Delta D_t = r_t B_{t-1} + X_t - M_t$, we get:

$$MM_t = EX_t + \lim_{i=\infty} \frac{\Delta D'_{t+i}}{(1+r)^i} + \sum_{j=t+1} \frac{\Delta EX_j - \Delta E_j}{(1+r)^{j-t}} \qquad (14)$$

Where MM_t is defined as $(M_t + r_tD_{t-1})$. Hence, EX_t represents the available foreign currency receipts and foreign reserves for spending, while MM_t represents foreign currency expense.

Assuming that EX_t and MM_t obey the I(1) process and follow a random walk with drift[13], we can obtain an empirical testable equation as follows:

$$EX_t = a + bMM_t + u_t \qquad (15)$$

If MM_t and EX_t are non-stationary, I(1) process, the null hypothesis to be tested is that MM_t and EX_t are co-integrated and that b = 1. Co-integration between these series is a necessary condition for the country to be solvent.

5.2 Debt-to-GDP Ratio

Alternatively, using the same external debt dynamic identity, the external debt to GDP ratio can be expressed in terms of last period external debt to GDP ratio, exports to GDP ratio, and imports to GDP ratio.

From (2),

$$D_{t+1} = (1+r_t)D_t + M_t - X_t \qquad (16)$$

Where X_t and M_t are exports and imports of goods and services without interest income and interest payment at time t, respectively. Dividing equation (16) by $Y_{t+1} = (1+g_t)Y_t$.

$$\frac{D_{t+1}}{Y_{t+1}} = \frac{(1+r_t)}{(1+g_t)} * \frac{D_t}{Y_t} - \frac{(1+gx_t)}{(1+g_t)}\frac{X_t}{Y_t} + \frac{(1+gm_t)}{(1+g_t)} * \frac{M_t}{Y_t} \qquad (17)$$

Where gx_t is the export growth rate and gm_t is the import growth rate.

Denote $\theta = \frac{(1+r_t)}{(1+g_t)}$ - the interest rate to GDP growth ratio, $\varphi = \frac{(1+gx_t)}{(1+g_t)}$ - the export growth to GDP growth ratio, $\rho = \frac{(1+gx_t)}{(1+g_t)}$ - the import growth to GDP growth ratio $\rho_{t-1} = \frac{M_{t-1}}{Y_{t-1}}$ - import-to-export ratio. Then equation (17) can be rewritten as the following difference equation:

$$d_t = \theta d_{t-1} - \varphi x_{t-1} + \rho m_{t-1} \qquad (18)$$

where, $x_t = \varphi x_{t-1}$ (19)

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[13] $EX_t = a_1 + EX_{t-1} + u_{1t}$

$E_t = a_2 + E_{t-1} + u_{2t}$, then Equation (23) can be rewritten as

$$MM_t = EX_t + \lim_{N\to\infty} \frac{\Delta D'_{t+j}}{(1+r)^j} + \frac{(a_1+a_2)}{r} + \sum_{j=t+1}^{\infty} \frac{(u_{1j}-u_{2j})}{(1+r)^{j-t}}$$

$$m_t = \rho m_{t-1} \qquad (20)$$

Assume that θ, φ and ρ are positive and constant over time. Solving the above difference equations (18) to (20) would yield the following path of external debt to GDP.

$$d_t = \theta^t d_0 - \varphi x_0 * \frac{(\varphi^t - \theta^t)}{(\varphi - \theta)} + \rho m_0 * \frac{(\rho^t - \theta^t)}{(\rho - \theta)} \qquad (21)$$

Equation (21) shows that the debt-to-GDP ratio (d_t) is determined by three parameters, the interest rate-to-export growth ratio (θ), the export growth-to-GDP growth ratio (φ), and the import growth-to-GDP growth ratio (ρ), as well as three initial predetermined variables, d_0, x_0 and m_0. Using the criterion in section IV that external debt is unsustainable when it persistently rises above 50 percent of GDP, equation (21) will be used to project the path of external debt from 2002 to 2010.

5.3 Debt-to-Export Ratio

This approach, as used by De Pines (1989) and Thanh, Minh, Huong and Hong (2001), derives the debt-to-export ratio to test for external debt sustainability. Dividing equation (2) by $X_t = (1+gx_t)\, X_{t-1}$,

$$\frac{D_{t+1}}{X_{t+1}} = \frac{(1+r_t)}{(1+gx_t)} * \frac{D_t}{X_t} + \frac{(1+gm_t)}{(1+gx_t)} * \frac{M_t}{X_t} - 1 \qquad (22)$$

Denote $d_t = \frac{D_t}{X_t}$ - the debt-to-export ratio, $\beta = \frac{(1+r_t)}{(1+gx_t)}$ - the interest rate to export growth ratio, $\Omega = \frac{(1+gm_t)}{(1+gx_t)}$ - the import growth to export growth ratio, and $V_{t-1} = \frac{M_{t-1}}{X_{t-1}}$ - import-to-export ratio. Equation (22) can be rewritten as follows:

$$d_t = \beta d_{t-1} + \Omega v_{t-1} - 1 \qquad (23)$$

$$v_t = \Omega v_{t-1} \qquad (24)$$

Assuming that β and Ω are positive and constant. Solving a system of differential equations, (23) and (24), a difference equation is obtained.

$$d'_t = \beta^t d_0 + \Omega v_0 * \frac{(\Omega^t - \beta^t)}{(\Omega - \beta)} - \frac{(1-\beta^t)}{(1-\beta)} \qquad (25)$$

Equation (25) indicates that the debt-to-export ratio (d'_t) is determined by two parameters - the interest rate-to-export growth ratio (β) and the import growth-to-export growth ratio (Ω), and two initial predetermined variables d_0 and v_0. The path of the debt-to-export ratio shows the ability to service debt. Also using the criterion in section VI, if this ratio continues to rise persistently above 130 percent of exports, external debt is unsustainable.

VI. Results of the empirical investigations

First, the unit roots and cointegration tests were employed to test for past external debt sustainability. Second, the paths of debt-to-GDP with different initial conditions were simulated to see whether they could explain unsustainability in the past. Then they were applied to assess future sustainability. Third, the same simulations were performed for the debt-to-export ratio.

6.1 The Intertemporal Model

In this section, first, the external debt series would be tested to see if they are stationary by looking at the changes over the long term. The external debt series are considered sustainable if the first differences are stationary. The augmented Dickey-Fuller unit root test was performed on the first differences of external debt according to the following specification.[14] Both the gross external debt and the gross external debt less foreign reserves series were tested here.

$$\Delta D_t = \alpha_0 + \alpha_1 D_{t-1} + \alpha_2 \Delta D_{t-1} + \alpha_3 \Delta D_{t-2} + \varepsilon_t$$

The null hypothesis is that α_1 is equal to zero while the alternative hypothesis is for it to be less than one. The test results showed that the null hypothesis was not rejected. Thus, it cannot be concluded that the external debt series were stationary, meaning that the external debt solvency condition was not accepted.[15] Therefore, both the gross external debt and the gross external debt subtracted by foreign reserves were not considered to be sustainable in the given periods.

Another way to verify external debt sustainability is to test equation (15) to determine whether exports plus transfers and last period foreign reserves (EX_t), and imports plus net interest rate payments (MM_t) are co-integrated. Before performing the co-integration test on the two series, their stationarity property needs to be tested. Table 6 summarizes a unit root test on each of the two variables from 1979 to 2001. The test results, using different numbers of lag length, suggested that both EX_t and MM_t contained unit roots. They, however, followed the I(1) process. Therefore, the co-integration relationship between them was tested. The external debt would be sustainable if the two series are cointegrated.

[14] See details of the testing procedure in Sawada (1993)

[15] During 1969-1989, there was an evidence for stationary at the 10 percent level although not shown here.

Table 6. Testing for Stationarity of the External Debt and

$\Delta D_t = \alpha_0 + \alpha_1 D_{t-1} + \alpha_2 \Delta D_{t-1} + \alpha_3 \Delta D_{t-2} + \varepsilon_t$		
	1. Gross Debt	2. Gross External Debt less Foreign Reserves
α_0	912.643 (0.597)	1337.883 (0.468)
D_{t-1}	-0.451 (-1.975)	-0.686 (-2.108)
ΔD_{t-1}	0.124 (0.510)	0.243 (0.888)
ΔD_{t-2}	0.153 (0.696)	0.052 (0.202)
Dickey-Fuller	-1.975	-2.108
Sample period	1973-2001	1979-2001

Note: T-statistics in parentheses. Critical values for the Dicky-Fuller test are -2.97 at the 5 percent level and 2.62 at the 10 percent level.

Table 7. The Unit Root Test, 1979-2001

Variable	ADF (1)	ADF (2)
EX	-0.426635	-0.236085
Δ EX	-3.755547**	-3.37707**
MM	-0.643778	-0.744127
Δ MM	-3.026058**	-2.862072*

Note: Intercept no Trend
* Significant at 1 % level.
** Significant at 5 % level.

The Johansen co-integration test with linear deterministic trend showed that EX and MM were not cointegrated with one lag of the difference term but they were cointegrated when two lags of the difference terms were specified.

Table 8. Johansen Co-integration Equation between EX and MM

No. of Lags	Trace Statistics
1	5.08 (15.41)
2	68.21** (15.41)

** Significant at the 5 percent confidence interval.
Figures in the parenthesis are critical value.

6.2 Debt-to-GDP ratio

The debt-to-GDP paths according to equation (21) were simulated using 1982 and 1989 as the starting periods. The year 1982 was selected to represent normal initial economic conditions before the economic difficulties in 1983-1984 whereas the year 1989 was selected as a penultimate period of the beginning of the financial liberalization, which started in 1990. Both simulated paths were calculated using the values of θ, φ and ρ from the periods 1982-2001 and 1989-2001, respectively.

Table 9. Parameters for Debt-to-GDP Ratio Simulation

	θ	φ	ρ	r	g	gx	gm
1982-2001	1.001	1.052	1.056	7.04	6.94	12.48	12.9
1989-2001	0.94	1.047	1.049	5.77	5.96	10.87	11.07
2002-2010	1.005	0.991	1.010	6.66	6.09	5.14	7.16

From the simulation according to equation (21), both of the debt-to-GDP paths have upward trends. During those two interval periods, the average export growth rate was slightly higher than the average import growth rate whereas both were significantly higher than the average GDP growth rate. On the other hand, the average interest rate was slightly above and below the average GDP growth during 1982-2001 and during 1989-2001, respectively. The path starting in 1982, increases from 34 percent in 1982, passes the threshold of 50 percent in 1994, and reaches to 86 percent in 2001. As for the path starting in 1989, the debt–to-GDP ratio increases from 32 percent in 1989, reaches the threshold in 1996 and increase to 74 percent in 2001. As both paths continue to have an upward trajectory after passing through the threshold, both demonstrate correctly that the external debt was unsustainable.

(a) Debt/GDP Ratio simulation1982-2001 (b) Debt/GDP Ratio Projection

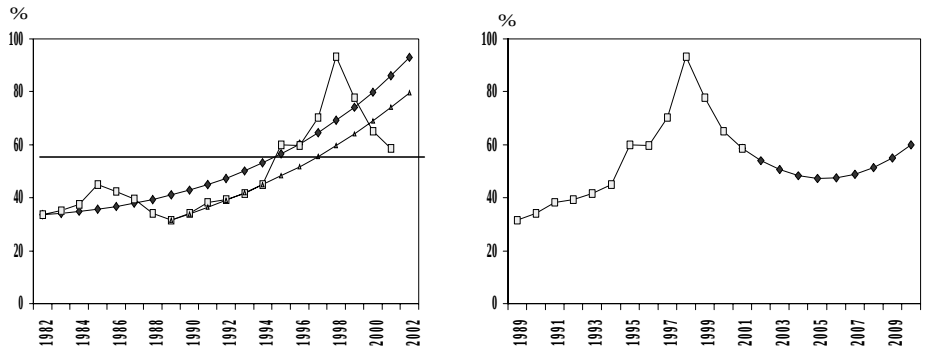

Figure 6. Simulation of Debt–to-GDP Ratio

Next the future medium term path until 2010 was projected using the same framework. A set of relevant parameters was selected to reflect the most likely scenario that the economy will grow at a certain degree such that the output gap will be gradually reduced by 2006 and 2007. However, in the data, the debt to export ratio path was reversed after the crisis as imports declined faster than exports, leading to a current account surplus. Therefore, the assessment of future medium term sustainability should have a new appropriate starting point. In this study, the debt-to-GDP ratio in 2001 was selected as large crisis adjustments had been going on in the earlier years after the crisis. Using 2001 as the base year, the simulation of the projected debt-to-GDP ratio shows a further decline from 58 percent in 2001 to lower than 50 percent starting from 2003. However, the ratio will marginally increase in 2006 and 2007 as the current account starts to become slightly negative. Nonetheless, it will start to increase more significantly afterwards when the current account starts to rise above the steady state range. This points out that, with the adopted assumption, the external debt would start to be unsustainable after 2008.[16]

[16] However, with the existing monetary policy under the inflation targeting framework together with the managed floating exchange rate regime, the domestic interest rate is set in line with the inflation and growth projection, leaving the exchange rate to be adjusted by market mechanisms. Thus, the current account deficits will be corrected to some extent by the depreciation of the real exchange rate. Hence, the path of external debt-to-GDP should increase less significantly than in the above projection.

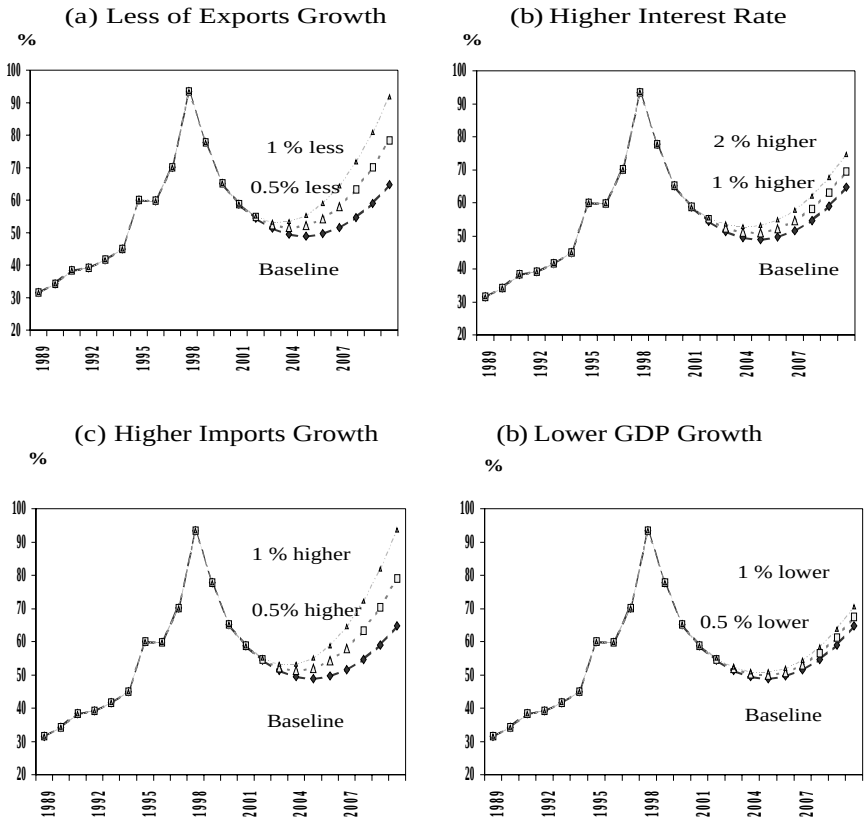

Figure 7. Sensitivity Analysis of Debt-to-GDP Ratio

The sensitivity analysis by varying the parameters with adverse risks associated with export growth, import growth, interest rate, and GDP growth was performed by changing each one of the rates above while holding the others constant. The results demonstrate that the debt-to-GDP path will rise much more significantly when the average export growth or average import growth is less than just half a percent and more than half a percent of the baseline's respectively. This suggests that the gap between export growth and import growth is crucial in determining future debt sustainability.

Three weak points of this assessment need to be mentioned here. First, this assessment rests on the assumption that the growth rates of export, import and GDP are constant through out the whole period. Under the floating exchange rate regime, the assumption that the gap between export growth and import growth would be constant after the current account turns negative might not be realistic as the exchange rate would depreciate to correct for this imbalance. Hence, the debt-to-GDP ratio should not increase as significantly as in the above example. Second, each of the above sensitivity analysis was performed without taking into account the effects of a change in one variable on the others such as the effect of an increase in export growth on GDP growth. Third, with the starting point in 2001 from the actual debt-to-GDP data, it was assumed in this study that

current account deficits would be financed totally by net debt inflows. If net equity inflows are included in the analysis, the path of future external debt will be below the one projected as the current account deficits will be partly financed by equity inflows; therefore, the path will reach the threshold later than that in the above analysis.

6.3 Debt-to Export Ratio

The paths of debt-to-export as in equation (25) were also simulated using 1982 and 1989 as the starting periods. Like in the above cases, the simulated paths were calculated using the values of β, and Ω from the periods 1982-2001 and 1989-2001 respectively. The value of Ω is equal to 1 as the average export growth rate was roughly the same as the average import growth rate. However, the value of β is 0.95 since the average interest rate was somewhat lower than the average growth rate of exports.

Table 10. Parameters for Debt-to-Export ratio Simulation

	β	Ω	*r*	*gx*	*gm*
1982-2001	0.952	1.003	7.04	12.48	12.9
1989-2001	0.954	1.001	5.77	10.87	11.07
2002-2010	1.015	1.019	6.66	5.14	7.16

The simulated debt-to-export path with 1982 initial values shows a downward trend until 1992 with the lowest point at 116 percent. After that it goes up to 129 percent of exports in 2001. On the other hand, the simulation using 1989 initial values at 86 percent rises throughout the whole period to 116 percent of exports in 2001.[17] Compared with the threshold of 130 percent of exports, both paths are always below the threshold in those periods. This implies that the projected paths could not demonstrate the unsustainability problem that the rule of thumb indicates. However, with correct directions, they suggest that problems might show up in the future periods.

[17] The paths in these two simulations have different shapes even though their parameter values are very close because the initial value of debt-to-export in the former is much higher than in the latter.

(a) Debt/Export Ratio simulation1982-2001 (b) Debt/Export Ratio Projection

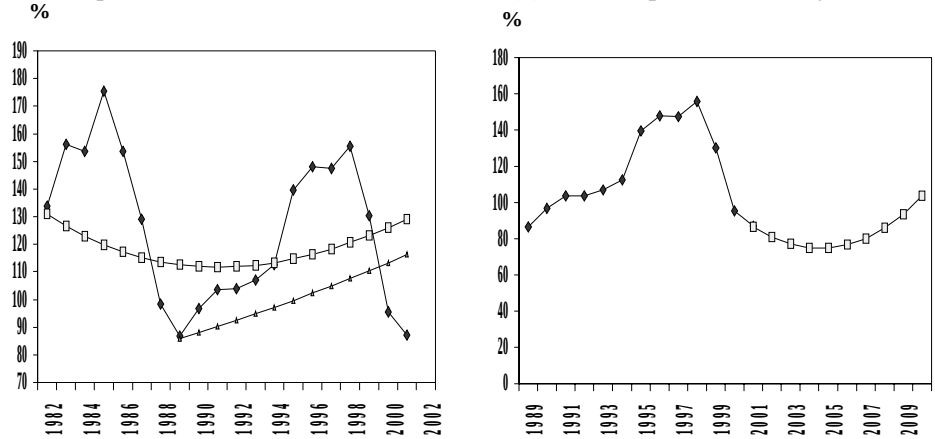

Figure 8. Simulation of Debt-to-Export Ratio

Even though, the above results could not explain the past unsustainability very well. The above framework should still be useful in assessing future sustainabilities especially in terms of the direction. Using 2001 as a starting point with the same parameters as in the case of debt-to-export ratio, the following baseline result was obtained. The simulated debt-to-export ratio declines from 2001 until 2005, but increases slightly in 2006 as the current account turns into deficit, and rises to 103 percent of exports in 2010. This projection shows the increasing trend of debt-to-export ratio but it is still far from the dangerous level by the end of 2010.

Similar to model I, the sensitivity analysis by varying the parameters with adverse risks associated with export growth, import growth, and interest rate was performed. In both cases, their paths will pass through the threshold when either the average export growth is 1 percent less than the baseline or the average import growth is 1 percent more than the baseline. These paths are also very sensitive to the gap between export growth and import growth like in the case of the debt-to-GDP ratio. It should be noted here that the analysis is subject to the same weak points as the debt-to-GDP ratio projection.

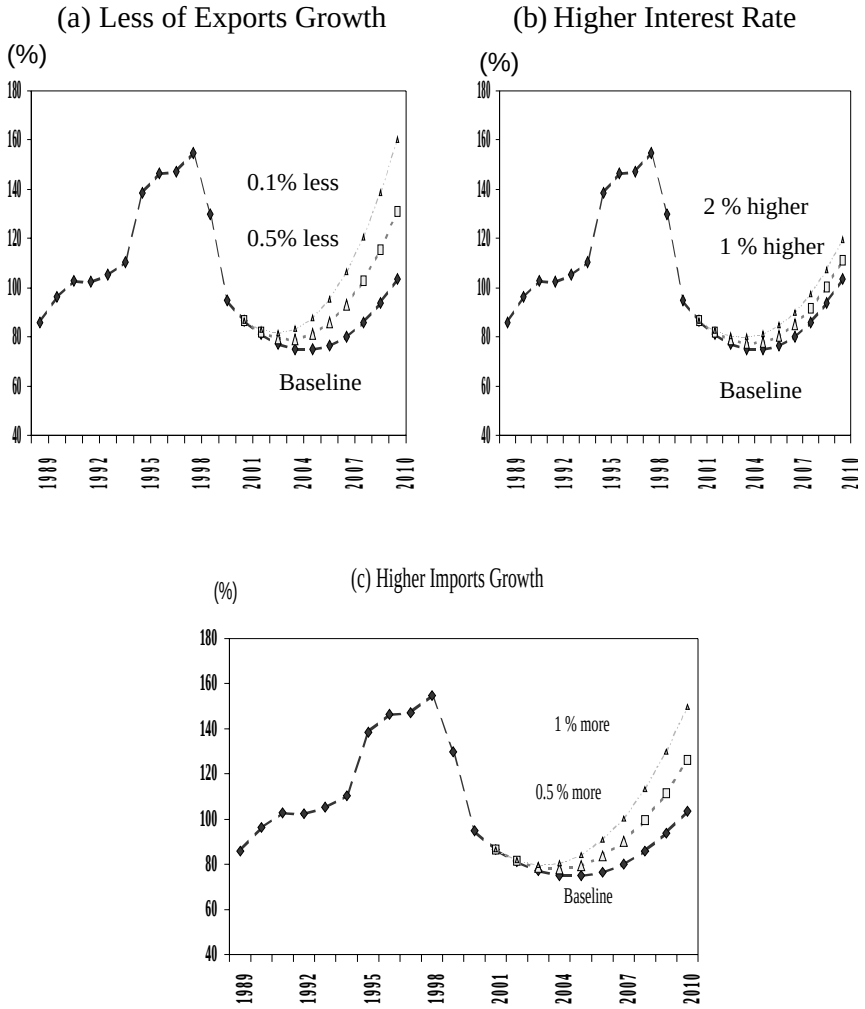

Figure 9. Sensitivity Analysis of Debt-to-Export Ratio

VII Concluding Remarks and Policy Recommendations

7.1 Concluding Remarks

The paper first explains the movements of the current account and external debt from 1790 up until 2001. The solvency and liquidity indicators, which together represent the overall sustainability conditions, demonstrate that the external conditions deteriorated in the 1980s and increasingly worsened between 1990 and 1997. However, both types of indicators have improved significantly after the crisis.

The steady state current account deficit calibration with the incorporation of FDI and short-term debt considerations indicates that, in the long term, Thailand's current account deficits should not persistently exceed the range of 2.3 to 3.3 percent of GDP. Furthermore, the results from unit roots and co-

integration tests for the intertemporal setting mostly support the case of external debt unsustainability in the past.

The future external debt sustainability assessment employed the projection of debt-to-GDP and debt-to-export ratios, assuming that the GDP gap would be reduced by 2006-2007. The result indicates that debt-to-GDP will be decreased from 2001 until 2005 and will increase marginally in 2006 and 2007. However, it will reach the threshold in 2008 and will increase unsustainably afterwards, if the gap between the average export and import growth rates is not reduced. On the other hand, the simulated debt-to-export ratio would not arrive at its threshold level until 2010. The sensitivity analysis illustrated that sustainability is quite sensitive to the gap between the average growth rates of exports and imports.

Further studies should focus on modifying the framework to better assess future sustainability under the existing flexible exchange rate system. The assumptions used in the simulations, especially when performing the sensitivity analysis, would be more realistic if they came from a model, which incorporates the interdependent relationship among the relevant variables. Moreover, as the findings in this study concentrate on the solvency condition, further studies by taking into account more of the liquidity aspect will give a more complete picture of future external sustainabily conditions.

7.2 Key Strategies and Policies for External Sector Balance

The Recent crisis has revealed major shortcomings in the management of external sector balance and its liquidity. Although there is no single strategy to effectively manage the external sector risks, integrated measures could be drawn up. They would involve macroeconomic policy management, structural improvement policies, reserve management policy, and measures to promote long-term capital and to dissuade short-term capital.

7.2.1. Macroeconomic policy management and Structural Improvement Policies

Given the fact that the Thai economy has to rely on foreign capital in the future. The obvious strategy from the paper is to contain future excessive current account deficits and reduce reliance on international capital. The existing monetary policy under inflation targeting with a managed floating exchange rate regime will already help to restrain the current account deficits and external debt from reaching the sustainable level.

However, fiscal discipline could also help limit the pressure on current account deficits. At the same time, the government should promote domestic savings to reduce the saving-investment gap and lessen the need for foreign capital. In addition, the policies to focus on improving competitiveness of domestic production and exports, upgrading technology, and attracting long-term capital are also very crucial in containing the gap between export growth and import growth.

7.2.2. Reserve management policy

Despite falling external debt, an increase in the world interest rate could affect the debt burden in the future. Under the flexible exchange rate regime, the authorities do not need to hold large foreign reserves to defend the value of the domestic currency. Nevertheless, they still need a certain amount of foreign reserves to pay debt obligations as well as to provide a cushion against external liquidity problems. As holding foreign reserves is costly, the authorities might want to expand credit lines with neighboring countries as an additional policy. Moreover, reserve management should also support debt management in order to avoid currency mismatch as well as possible exchange rate volatility from lack of coordination. Additionally, the benchmarks for liquidity, interest rate and composition of currencies should be set for debt management.

7.2.3. Measures to promote long-term capital flows

In addition to macroeconomic policies, the authorities should promote long-term capital flows, particularly long term non-debt flows, i.e., foreign direct investment as it is less volatile and has positive spillover effects. Meanwhile, they might consider prudential measures to manage capital flows such as setting up reserve requirements for overseas borrowings with short-term maturity. Moreover, they might also attempt to create moral suasion strategies to dissuade financial institutions from short-term external funding and lending to the unproductive sector.

Furthermore, the policymakers themselves must be well-equipped with a good domestic database for policy making. Particular attention should be on improving some inaccurate and untimely data such as those related to private external borrowing. Moreover, transparency in providing key economic and financial data must be enhanced for better informed and rational investment decisions by investors.

Appendix
Regression of FDI on Real GDP

The result of the OLS regression of the FDI and on the real GDP is as follows:

Dependent Variable: LOG(FDI)				
Method: Least Squares				
Sample (Adjusted): 1971-2001				
Variable	Coefficient	Std. Error	t-Statistics	Prob.
Constant	-27.5314	3.6762	-7.4889	3.71E-08
LOG(Real GDP)	2.387748	0.2589	9.2194	5.61E-10
AR(1)	0.466405	0.1671	2.7903	0.00937
R-squared	0.917953	Mean dependent var	6.206929	
Adjusted R-squared	0.912093	S.D. dependent var	1.559914	
S.E. of regression	0.462501	Akaike info criterion	1.387431	
Sum squared resid	5.989409	Schwarz criterion	1.526204	
Log likelihood	-18.5052	F-statistics	156.6344	
Durbin-Watson stat	1.768922	Prob (F-statistics)	6.26E-16	

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