



Asian Bond Market Development : Policy Implications, Empirical Relationships & Future Direction

Jonathan A. Batten
Graduate School of Management
Macquarie University Sydney, Australia
Email: jabatten@gmail.com

and

Pongsak Hoontrakul
Sasin of Chulalongkorn University, Thailand
Email: Pongsak@Hoontrakul.com

Workshop and Research Colloquium
Sasin 4th May 2006

we are "Chief of the Rabbits"



Asian Bond Market Development:

- Background-What is so interesting about Asia-Pacific Bond markets? (Introduction and Motivation)
- Policy Implications Asia Pacific and Thailand
- Empirical Relationships of Credit Spreads on International Bonds – spreads on duration matched international bonds
- Future Directions

Asian Bond Market Development

we are "Chief of the Rabbits"





Background on Presenter: Jonathan A. Batten

Visiting Professor, IIS Trinity College Dublin (until September 2006),
Professor, Macquarie Graduate School of Management, Sydney (from August 2004). Previously Professor of Finance at Seoul National University, Korea.

Coeditor, Research in International Business and Finance (until January 2007)

Editor, Emerging Markets Review (from January 2007)

Co-editor, International Review of Financial Analysis (from January 2007)

I will talk later about publishing in academic journals and editorial policy at EMR/IRFA/RIBAF and Elsevier-North Holland's plans

Asian Bond Market Development

we are "Chief of the Rabbits"

3



Research in International Business and Finance

Description

RIBAF has successfully gone through the production of Seventeen Research Volumes. As an annual academic research volume publication it has explored and provided insight on various, economic, international business and finance topics. At this juncture, it is planned that RIBAF will take on a new role.

RIBAF will assume an academic journal format commencing with Volume 18 in 2004. The focus of the new journal format will be to present academic and applied research germane to the International Business and Finance arena. The editors encourage the submission of high quality papers that are concerned with the theoretical or empirical aspects of the following broadly defined topics:

- (1) International economics, finance and accounting.
- (2) Business dynamics and strategy in the multinational firm.
- (3) The public policy debate as it affects international organizations and multilateral relationships.
- (4) Foreign direct investment and the international investment decision of the firm.
- (5) Financial market integration, disintermediation and financial system evolution.
- (6) Country risk and political risk assessment and management.

The articles accepted for publication will be rigorously peer reviewed prior to acceptance and publication. Author acceptance will be driven only by the quality of the research submitted. Specific issues and volumes of the journal will be devoted to defined subjects within the realm of international business and finance.

RIBAF aims to provide an even broader distribution of the ideas presented through the journal format, than that achieved by the research volume format, and therefore to create more visibility for its authors.

Asian Bond Market Development

we are "Chief of the Rabbits"

4

Emerging Markets Review

Description

The need for tools to address the many challenges posed by emerging markets has been growing faster than academic research has provided. In many areas, the invention of novel tools has shifted increasingly from academics to practitioners themselves. This trend invites renewed exchange between practitioners and scholars, all of whom look for critical thinking about the important issues in emerging markets, and for tools that help them understand and solve the many problems they face in these markets. The *EMR* aims to respond to these needs.

EMR articles must analyze formally macro, micro, financial, institutional or other data from emerging markets, and should also provide tools or reach conclusions that are useful to practitioners.

The *EMR* welcomes articles from all disciplines that relate to emerging markets such as finance, economics, political economy, industrial organization, law and economics, and institutional economics. Areas of coverage range from topics as diverse as investment strategies, corporate finance, exchange rate policies, regulatory frameworks, institutional designs, project finance, privatizations, and the role of the legal system and the courts, among others. In essence, the *EMR* seeks to attract high quality, well-defined, and useful research on emerging markets from both scholars and practitioners.

Asian Bond Market Development

we are "Chief of the Rabbits"



International Review of Financial Analysis

Description

The *International Review of Financial Analysis (IRFA)* is a non-affiliated refereed journal whose primary goal is to provide an outlet for high quality Financial Research. The journal is open to a diversity of Financial Research topics and will be unbiased in the selection process. The focus of *IRFA* is not limited to U.S. centric topics but, as its title implies, is open to value added research output from around the world.

The editors deem that Financial Research output exploring a broad spectrum of cultural, spatial, institutional, historical, regulatory, and methodological differences will assist in advancing the core body of Finance knowledge. The intent of the editors is to have *IRFA* provide a vehicle for the dissemination of international Finance Research ideas and results.

Asian Bond Market Development

we are "Chief of the Rabbits"





What is so interesting about Asia-Pacific bond markets?

With the exception of Japan, local bond markets before the currency crisis were **small and under-developed (see BBS, 2006)**

- Markets for government bonds and government-guaranteed bonds were not well-developed (conservative fiscal policy etc.)
- Corporate bond market was relatively large, but
 - dominated by guaranteed-corporate bonds
 - "buy-and-hold" investors / no "marked-to-market" system

Significant development of local bond markets after the currency crisis:

- Government bond market: To finance public fund for financial restructuring and boost depressed economy by fiscal pump priming (Government-led Development)
- Corporate bond market: To raise funds from bond markets to overcome Banks' reluctance to extend loans (this was an unexpected by-product of crisis)

While this is a familiar story lessons learnt are important for others and the development must continue.

Asian Bond Market Development

we are "Chief of the Rabbits"



What is so interesting about Asia-Pacific bond markets?

The **1997 financial crisis** gave a major boost to regional and domestic bond markets across East Asia as alternatives to bank intermediation- but there is still enormous impetus and **scope for change!**

Bond Markets in Asia-Pacific
(in US\$ billions)

	1997					2005				
	Government	Corporate	Financial	Total	% of GDP	Government	Corporate	Financial	Total	% of GDP
China	67.4	6.3	42.7	116.4	12.9	331.8	12.2	208.0	552.0	31.5
Hong Kong	13.1	32.7		45.8	26.4	16.0	66.9		82.9	48.7
Indonesia	0.9	2.0	1.7	4.6	1.9	48.5	3.8	2.9	55.2	20.6
Korea	21.6	57.1	51.7	130.4	25.1	183.5	155.0	261.3	599.8	81.0
Malaysia	19.4	20.8	16.8	57.0	56.4	49.2	45.6	20.3	115.1	93.2
Philippines	16.6	0.3		16.9	20.5	35.8	0.1	0.2	36.1	39.4
Singapore	13.0	10.7		23.7	24.9	45.1	34.5		79.6	71.4
Thailand	0.3	9.0	1.1	10.5	6.6	34.7	22.6	14.8	72.1	42.3
Vietnam						4.3			4.3	10.0
Japan	2,383	578	1,650	4,608	116	6,929	836	1,516	9,281	187
US	4,452	1,889	5,528	11,870	143	5,697	2,659	11,192	19,548	158

Sources: Asian Development Bank, Dealogic Bondware, Bank for International Settlements.

Asian Bond Market Development

we are "Chief of the Rabbits"





What is so interesting about Asia-Pacific bond markets?

In several countries, including Korea and Malaysia, the size of the corporate bond market has even caught up with that in the US as a percentage of GDP. But the development of bond market is **disparate**.

Bond Markets in Asia-Pacific (in US\$ billions)

	1997				2005					
	Government	Corporate	Financial	Total	% of GDP	Government	Corporate	Financial	Total	% of GDP
China	67.4	6.3	42.7	116.4	12.9	331.8	12.2	208.0	552.0	31.5
Hong Kong	13.1	32.7		45.8	26.4	16.0	66.9		82.9	48.7
Indonesia	0.9	2.0	1.7	4.6	1.9	48.5	3.8	2.9	55.2	20.6
Korea	21.6	57.1	51.7	130.4	25.1	183.5	155.0	261.3	599.8	81.0
Malaysia	19.4	20.8	16.8	57.0	56.4	49.2	45.6	20.3	115.1	93.2
Philippines	16.6	0.3		16.9	20.5	35.8	0.1	0.2	36.1	39.4
Singapore	13.0	10.7		23.7	24.9	45.1	34.5		79.6	71.4
Thailand	0.3	9.0	1.1	10.5	6.6	34.7	22.6	14.8	72.1	42.3
Vietnam						4.3			4.3	10.0
Japan	2,383	578	1,650	4,608	116	6,929	836	1,516	9,281	187
US	4,452	1,889	5,528	11,870	143	5,697	2,659	11,192	19,548	158

Sources: Asian Development Bank, Dealogic Bondware, Bank for International Settlements.

Asian Bond Market Development

we are "Chief of the Rabbits"



9



What is so interesting about Asia-Pacific bond markets?

Consequently market volumes have increased two-fold or more, and corporate issuance has (generally) expanded **hand-in-hand** with the government bond market.

Bond Markets in Asia-Pacific (in US\$ billions)

	1997				2005					
	Government	Corporate	Financial	Total	% of GDP	Government	Corporate	Financial	Total	% of GDP
China	67.4	6.3	42.7	116.4	12.9	331.8	12.2	208.0	552.0	31.5
Hong Kong	13.1	32.7		45.8	26.4	16.0	66.9		82.9	48.7
Indonesia	0.9	2.0	1.7	4.6	1.9	48.5	3.8	2.9	55.2	20.6
Korea	21.6	57.1	51.7	130.4	25.1	183.5	155.0	261.3	599.8	81.0
Malaysia	19.4	20.8	16.8	57.0	56.4	49.2	45.6	20.3	115.1	93.2
Philippines	16.6	0.3		16.9	20.5	35.8	0.1	0.2	36.1	39.4
Singapore	13.0	10.7		23.7	24.9	45.1	34.5		79.6	71.4
Thailand	0.3	9.0	1.1	10.5	6.6	34.7	22.6	14.8	72.1	42.3
Vietnam						4.3			4.3	10.0
Japan	2,383	578	1,650	4,608	116	6,929	836	1,516	9,281	187
US	4,452	1,889	5,528	11,870	143	5,697	2,659	11,192	19,548	158

Sources: Asian Development Bank, Dealogic Bondware, Bank for International Settlements.

Asian Bond Market Development

we are "Chief of the Rabbits"

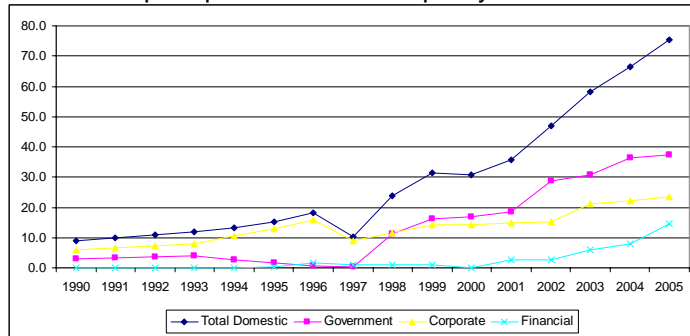


10



What is so interesting about Asia-Pacific bond markets?

Take Thailand as an example- where there is staggering growth across all sectors, though it is also clear that recently growth differs between sectors- the interesting question of **why some sectors develop more than others** has prompted considerable policy efforts!



Domestic Bond Issuance by Sector 1990-2005 (billions of US\$)

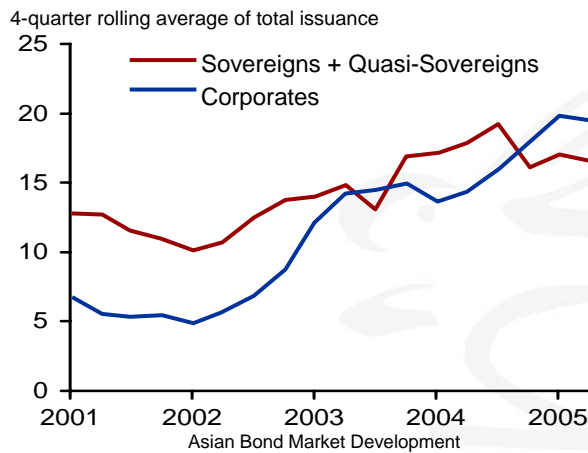
Asian Bond Market Development

we are "Chief of the Rabbits"



What is so interesting about Asia-Pacific bond markets?

Globally, emerging market corporate issuance has been **increasing**, while sovereign issuance has been **stable** since 2004



Source: Credit Suisse

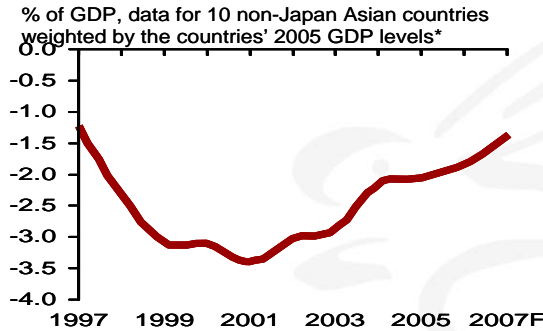
Asian Bond Market Development

we are "Chief of the Rabbits"





What is so interesting about Asia-Pacific bond markets?
 In recent years government issuance has been falling (improved fiscal balance) but this will likely change as governments **stimulate sluggish economies and fund infrastructure** (even if public-private mix)



Non-Japan Asia Fiscal Balance *Does not include Vietnam.
 Source: CEIC, Credit Suisse

Asian Bond Market Development



What is so interesting about Asia-Pacific bond markets?
 Even with expected decline in growth there is still the need to fund non-Japan Asia's ongoing infrastructure needs

	2005	CS forecasts as of December 2005		CS forecasts as of March 2006		Consensus	
		2006F	2007F	2006F	2007F	2006F	2007F
China	9.9	10.1	9.7	10.1	9.7	9.1	8.7
Hong Kong	7.3	4.4	3.6	5.0	3.8	5.3	4.5
India	8.1	8.5	8.5	8.5	8.5	7.3	na
Indonesia	5.6	4.7	5.2	5.0	6.0	5.1	5.5
Korea	4.0	4.4	3.7	4.7	4.2	5.0	4.7
Malaysia	5.3	5.4	5.1	5.4	5.1	5.4	5.2
Philippines	5.1	5.3	5.6	5.3	5.6	4.7	4.7
Singapore	6.4	6.0	5.0	7.0	6.0	6.0	5.2
Taiwan	4.1	4.9	4.7	4.9	4.0	4.1	4.1
Thailand	4.5	4.7	5.2	4.7	5.0	4.5	5.0
Asia-10 (average)	6.0	5.8	5.6	6.1	5.8	5.7	5.3
Asia-10 (average weighted)	7.5	7.6	7.3	7.7	7.4	7.1	5.8

Data for 10 non-Japan Asian countries weighted by the countries' 2005 GDP levels.
 Source: CEIC, Asia Pacific Consensus Forecasts March 2006, Credit Suisse

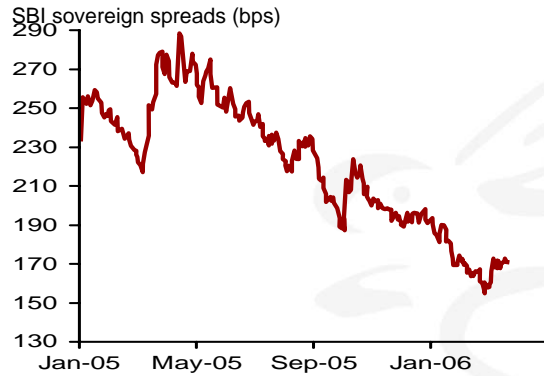
Asian Bond Market Development





What is so interesting about Asia-Pacific bond markets?

Spreads have recently risen but are still at historic lows- is this an opportune time to issue long term fixed?



Asian Bond Market Development

Source: Credit Suisse

we are "Chief of the Rabbits"

15



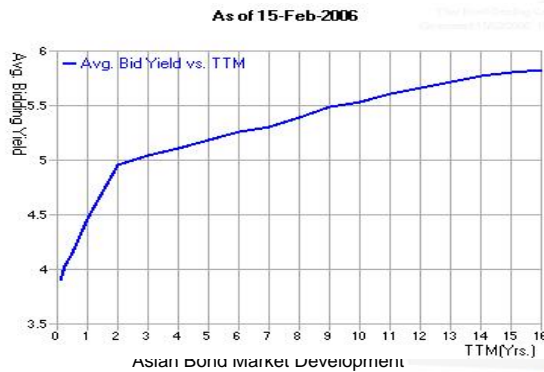
What is so interesting about Asia-Pacific bond markets?

However the domestic and international interest rate environment is becoming **hostile**- many borrowers with long term funding needs may have missed the boat!

Will they fund short and what are the **risk** implications?

Historically international rates are still low!

eg Thai Term Structure April 2006



Asian Bond Market Development

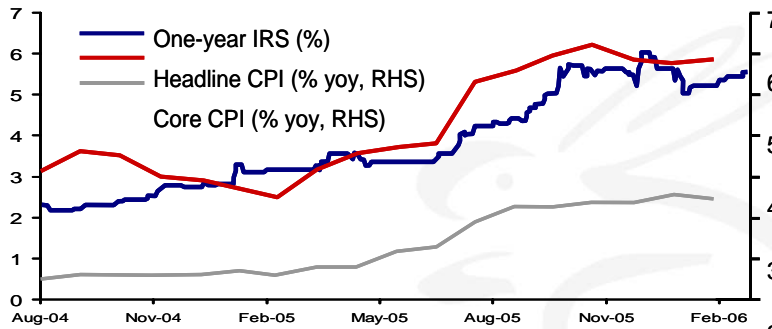
we are "Chief of the Rabbits"

16



What is so interesting about Asia-Pacific bond markets?

Consequently, long term corporate financing will become more expensive since there is pressure on market interest rates to rise if inflation continues to climb



Asian Bond Market Development

Source: Ministry of Commerce, CEIC, Credit Suisse

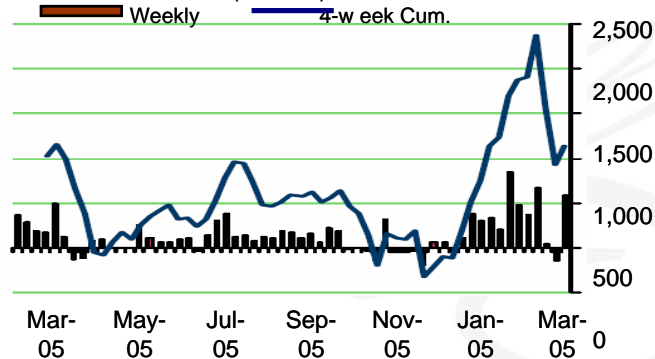
we are "Chief of the Rabbits"



What is so interesting about Asia-Pacific bond markets?

At the moment there is still strong demand from international investors chasing yield but improved performance in major stock markets is encouraging rebalancing in favour of traditional investments

Dedicated EM Funds Flows (USD mn)



Asian Bond Market Development

Source: EmergingPortfolio.com, Credit Suisse

we are "Chief of the Rabbits"





What is so interesting about Asia-Pacific bond markets?

When measuring risk, **credit spreads** are a better indicator of credit quality than credit ratings:

Agencies' ratings comparisons with spread-implied ratings

	Current Rating	Rating consistent with current spread	Ratings-change that would justify current spread (in notches)	Current five-year CDS Spread (bps)	Spread that would match current rating (bps)
Argentina	B3/B-	Ba2/BB-	+4 /+3	261	680 /752
Brazil	Ba3/BB	Ba2/BB+	+1 /+1	123	265 /167
Bulgaria	Baa3/BBB-	Baa2/A-	+1 /+3	29	47 /81
Colombia	Ba2/BB	Ba2/BB+	+0 /+1	121	117 /167
Ecuador	Caa1/CCC+	B2/B	+2 /+2	391	961 /1,025
Egypt	Ba1/BB+	Baa3/BBB	+1 /+2	64	89 /107
Lebanon	B3/B-	Ba2/BB	+4 /+4	211	680 /752
Morocco	Ba1/BB+	Baa3/BBB	+1 /+2	59	89 /107
Panama	Baa1/BB	Ba1/BB+	-3 /+1	111	19 /167
Peru	Ba3/BB	Ba2/BB	+1 /+0	202	265 /167
Philippines	B1/BB-	Ba2/BB	+2 /+1	184	359 /259
Romania	Ba1/BBB-	Baa2/A-	+2 /+3	34	89 /81
Turkey	Ba3/BB-	Ba2/BB+	+1 /+2	134	265 /259
Ukraine	B1/BB-	Ba2/BB	+2 /+1	174	359 /259
Venezuela	B2/BB-	Ba2/BB+	+3 /+2	135	457 /259

Source: Credit Suisse

Asian Bond Market Development

we are "Chief of the Rabbits"

19

What is so interesting about Asia-Pacific bond markets?

The development of regional bond markets tackled 4 main areas mostly in domestic corporate and government markets:

- **Supply** side impediments (providing an enabling environment; maintaining the reform of corporate governance);
- **Demand** side impediments (strengthening the role of institutional investors and mutual funds; considering private placement as a short-term option; and
- **Infrastructure** impediments (ensuring that credit ratings are reliable; creating benchmark yield curves; providing quality settlement and risk management systems and technology; bond trading platforms and intermediation e.g. the rise and fall of the Thai Bond Dealer Club)
- Regulation ensuring that there is an effective and enforceable regulatory framework and appropriate tax rules
- Recent focus to foreign bond and international issues
 - Providing benchmarks
 - Improving reputation
 - Leading others by example

Asian Bond Market Development

we are "Chief of the Rabbits"

20



What is so interesting about Asia-Pacific bond markets?

Despite these achievements:

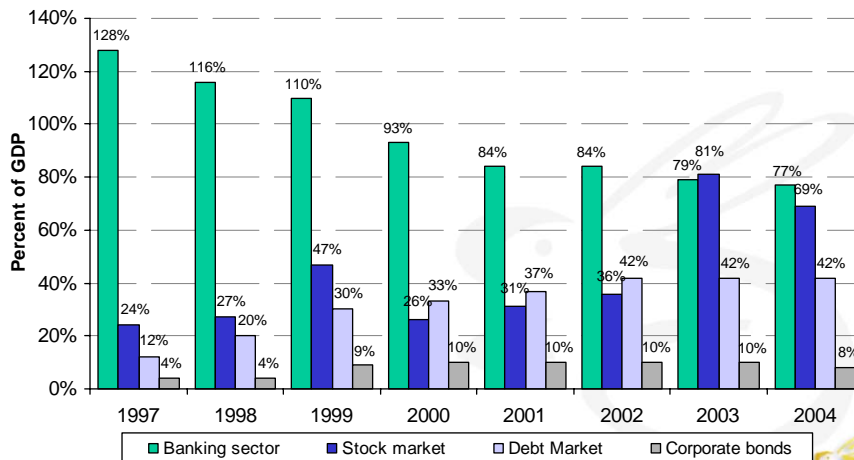
- The development of local markets remains **modest** by the standards of those in more developed countries.
- There remains considerable **variation** in the scale and scope of financial markets more generally within the region.
- There are **gaps in development** e.g. one critical market segment already present in a small group of advanced financial markets remains largely overlooked: the presence of foreign bond issuers
- Bond markets provide the **best method** to transfer short-term savings into long-term resource development since this is a high saving region
- Let us briefly review progress in the Thai bond markets

Asian Bond Market Development



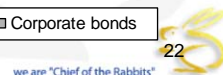
Thailand's Bond Markets

While bank loans are still a **main funding** source for the economy, financing by bonds has increased steadily (disintermediation)



Source: Thai Bond Dealing Centre

Asian Bond Market Development



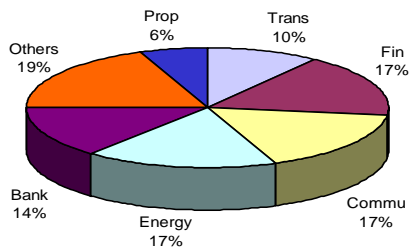


Thailand's Bond Markets

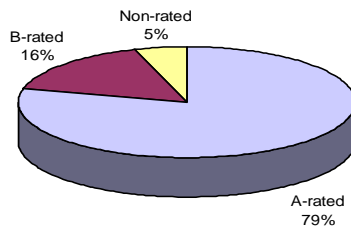
Profile of corporate bond issuers (as of 30 June 2005)

Issuers are from a range of sectors and most are of good credit quality

Corporate bonds, outstanding value by sector



Corporate bonds, outstanding value by rating



Source: ThaiBMA.

Asian Bond Market Development

we are "Chief of the Rabbits"



Thailand's Bond Markets

Size compares favourably to others within AP across a range of criteria but markets are still small

Size of corporate bond markets and other channels of local currency funding (Selected countries, end-2004)

	Corporate bonds ¹		Other channels as % of GDP		
	Amounts outstanding (USD billions)	As % of GDP	Domestic credit	Stock market capitalisation	Government bonds
Australia	187.5	27.1	185.4	111.5	13.8
China	195.9	10.6	154.4	33.4	18.0
Hong Kong SAR	61.9	35.8	148.9	547.7	5.0
India	24.5	3.3	60.2	56.8	29.9
Indonesia	6.8	2.4	42.6	24.5	15.2
Japan	2,002.0	41.7	146.9	76.9	117.2
Korea	355.6	49.3	104.2	74.7	23.7
Malaysia	49.7	38.8	113.9	140.8	36.1
New Zealand	29.9	27.8	245.5	41.1	19.9
Philippines	0.2	0.2	49.8	37.5	21.8
Singapore	21.7	18.6	70.1	211.4	27.6
Thailand	31.9	18.3	84.9	67.1	18.5
<i>Memo: United States</i>	<i>15,116.6</i>	<i>128.8</i>	<i>89.0</i>	<i>138.4</i>	<i>42.5</i>

¹Domestic and international bonds and notes in domestic currency issued by residents and non-residents. Sources: IMF; World Federation of Exchanges; Dealogic Bondware; national data; BIS

Asian Bond Market Development

we are "Chief of the Rabbits"



Thailand's Bond Markets

and trade size is small and bid-ask spreads modest in secondary corporate bond markets. Suggests limited liquidity

	Market type	Trade size in local currency	Bid-offer spread (basis points)	Ex post transparency
Australia	OTC/Exchange		2-10	...
China	OTC/Exchange	...	5-10	...
Hong Kong SAR	OTC	50-100m	10-15	...
India	OTC/Exchange	50m
Indonesia	OTC
Japan	OTC
Korea	OTC/Exchange	10bn	2-5	Yes (KSDA)
Malaysia	OTC	5m	5-10	Yes (BIDS)
New Zealand	OTC	...	5-15	...
Philippines	OTC	25-50m	Varies	...
Singapore	OTC	1-5m	10-15	...
Thailand	OTC/Exchange	10-40m	5-10	Yes (ThaiBMA)

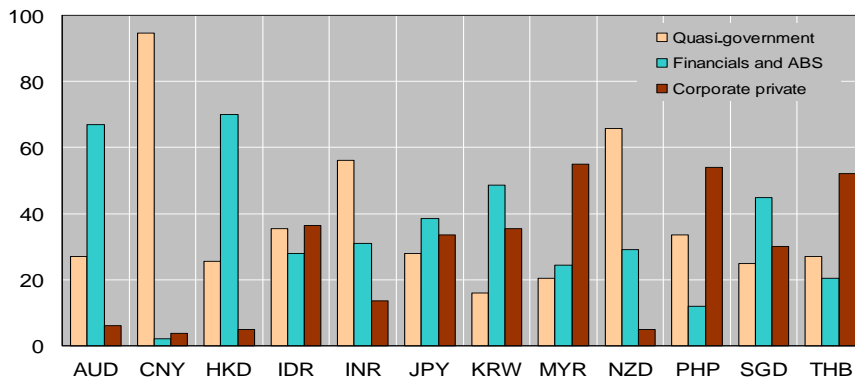
Sources: Bloomberg, Citigroup (2005), and informal discussions with market participants.

Asian Bond Market Development



Thailand's Bond Markets

Modest ABS and Financial but strong presence of corporate issuers
Types of issuers in 12 corporate bond markets
In % of total outstanding, end-2004



Asian Bond Market Development

Sources: Dealogic Bondware and BIS.





Thailand's Bond Markets

..although more needs to be done to protect investors

Country	Borrowers' and lenders' legal rights index	Contract enforcement time (days)	Contract enforcement cost (as percentage of debt)	Length of bankruptcy process (years)	Bankruptcy costs (as percentage of estate)
China	2	241	25.5	2.4	18
India	4	425	43.1	10	8
Korea	6	75	5.4	1.5	4
Malaysia	8	300	20.2	2.3	18
Thailand	5	390	13.4	2.6	38
Asia	5	286	22	4	17
Mature markets	7	165	9	2	7

Source: IMF (2005): Chapter IV on "Recent Trends in Corporate Finance", *Global Financial Stability Report*, April.

Asian Bond Market Development

29

we are "Chief of the Rabbits"



Thailand's Bond Markets

..and improve key institutional features

Country	Accounting standards	Rule of law	Judicial efficiency	Contract repudiation	Expropriation risk
India	5.7	4.2	8	6.1	7.8
Korea	6.2	5.4	6	8.6	8.3
Malaysia	7.6	6.8	9	7.4	8
Thailand	6.4	6.3	3.3	7.6	7.4
Asia	6.5	5.7	6.6	7.4	7.9
G-3	6.6	9.4	9.7	9.5	9.9

Source: IMF (2005): Chapter IV on "Recent Trends in Corporate Finance", *Global Financial Stability Report*, April.

Asian Bond Market Development

30

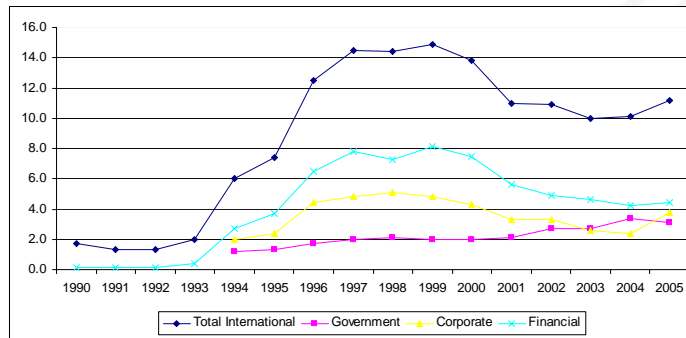
we are "Chief of the Rabbits"



Thailand's Bond Markets

Thai **international bond issuance** is rarely discussed or considered but was very important as a funding source during the Crisis Period. We focus on international bonds later

International Bonds Issuance by Sector 1990-2005 (billions of US\$)



Asian Bond Market Development

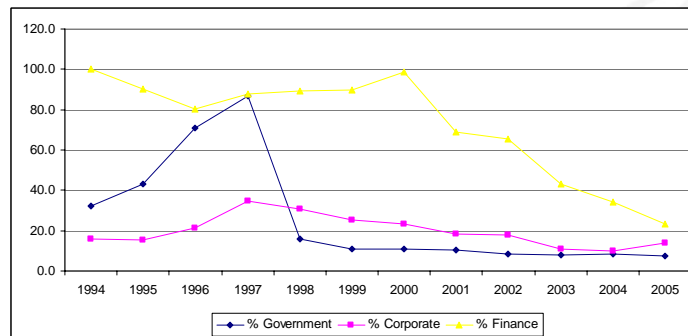
we are "Chief of the Rabbits"

31



Thailand's Bond Markets

Thai international bond issuance- Issuance by all sectors **has declined** as domestic bond markets developed. Note that cross-currency swap US/THB underpins this market and prospered when there was little investor appetite for domestic fixed LT debt. Sector as a Percentage of Total Issues



Asian Bond Market Development

we are "Chief of the Rabbits"

32



Thailand's Bond Markets

Some key policy implications

Investor Demand

- International Investors chasing yield but there are restrictions to limit speculation on the THB
- Local investors looking for investment alternatives (risk, maturity and liquid-marketable products)
- Markets are broadly segmented
 - Retail preference in stock investment and bank deposit (bank deposit ratios very high and so little incentive for banks to issue securities) –need retail investment not just institutional to fully develop local markets
 - Institutional Investor preferences and implications (need LT debt choices)
Provident Fund with tax benefits v.s. Mutual Fund
 - Bank & Financial Institution preference (Liquidity management, not long term annuity management)
 - Tax distortions due to different treatment on capital gains on stocks and bonds

Asian Bond Market Development

we are "Chief of the Rabbits"



33



Thailand's Bond Markets

Some key policy implications

Financial Market Infrastructure

- Well documented problems related to incomplete and imperfect markets [e.g. lack of liquidity, absent derivative market, high transaction cost, etc.]
- Absence of secondary market due to captive local investors (Buy & Hold)
- "Sovereign Ceiling Effect" may hinder market development. This suggests scope for foreign bond issue.
- High risk local investors prefer stock to bond investment due to tax distortion

Asian Bond Market Development

we are "Chief of the Rabbits"



34



It is critical that the impetus for bond market development be maintained

- What has been achieved (implementation of key policy areas)
 - ASEAN+3 bond fund
 - Secondary market trading problems
 - Limited role for benchmarking to international bonds eg Philippine Global Bonds
 - Significant infrastructure has been established but there is an ongoing need
- What can be achieved in the ST (hype versus facts)
 - Worldwide trend to electronic trading platforms and settlement systems
 - Need derivatives markets to facilitate risk management
 - An end to capital flow restrictions
 - Demand side problems and saving = captive investment
- What could be achieved in the LT
 - Target bond markets at 100% of GDP
 - Efficient and viable domestic, foreign and international bond markets on par with Europe
 - Viable alternative to banking and diverse offering of products and credit facilities to corporations and governments

Asian Bond Market Development

we are "Chief of the Rabbits"

35



It is critical that the impetus for bond market development be maintained

However, to achieve these objectives we need a better understanding of

- What causes bond prices and yields to change: that is how are these changes related to macroeconomic and financial market factors and linkages between them
- We know about linkages between stocks and bond prices (co-dependence versus independence and portfolio rebalancing by offshore investors)
- We can explain stock returns (badly) using CAPM and multifactor asset pricing models
- But what about the spreads of risky bonds over riskless bonds?

Some of the key empirical issues are now discussed...

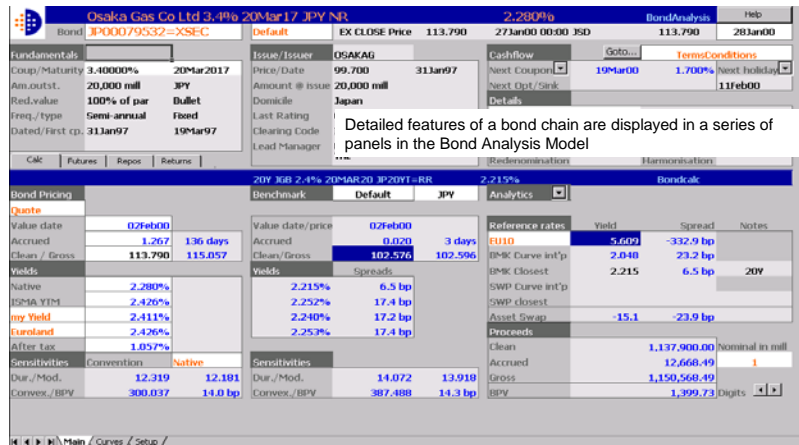
Asian Bond Market Development

we are "Chief of the Rabbits"

36

Key Empirical Issues: Spreads and Yield Curves

Exactly what is a credit spread- start with information about the bond available in secondary markets

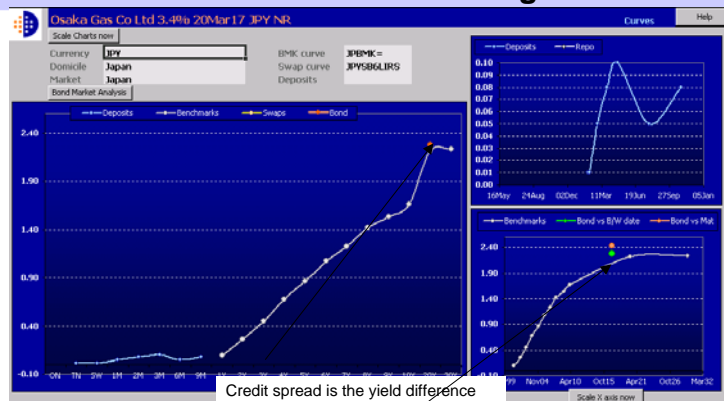


Asian Bond Market Development

we are "Chief of the Rabbits"

37

A credit spread is the yield difference between the individual bond and an underlying benchmark which is formed from a spline (usually cubic) function- how you measure the spread is of importance to traders and investment managers



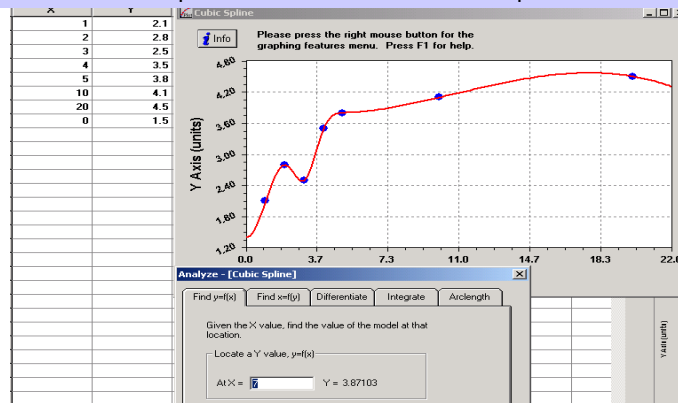
Asian Bond Market Development

we are "Chief of the Rabbits"

38

Benchmark bonds and aggregated bond by credit ratings are usually interpolated to produce smooth curves- but there are many issues associated with this approach and of course one must also consider liquidity

For example, a cubic spline interpolates the 7 year bond rate at 3.87103% compared with 3.92% with a linear spline



Asian Bond Market Development

we are "Chief of the Rabbits"

39



Key Empirical Issues: Spreads and Yield Curves-They are Dynamic

However we need to be aware of the effects of what economic factors will "drive" the spread, that is cause the spread to change over time

This is important for risk management, hedging, and modelling spreads.

Spread traders would sell the spread when it was high expecting the spread to decline.

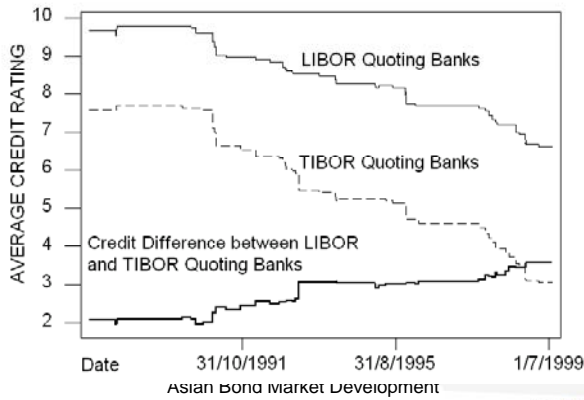
An example of this was the trading of TIBOR-SIBOR futures contracts in the 1990s due to the so called "Japan Premium". See Batten and Covrig (JAPE 2004)

Asian Bond Market Development

we are "Chief of the Rabbits"

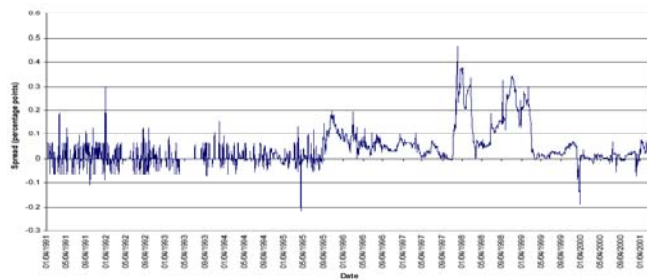
40

Key Empirical Issues:
Spreads and Yield Curves-They are Dynamic
 An Example of Spread Trading:
 The TIBOR-LIBOR spread
 There was a change in the average credit quality of quoting banks
 on LIBOR and TIBOR



Key Empirical Issues:
Spreads and Yield Curves-They are Dynamic
 The TIBOR-LIBOR spread
 Traders would sell the spread when it was high expecting the spread to decline (mean reversion)

Figure 1: TIBOR-LIBOR Spread



That is, they expect that over time the spread will drift back to zero. The problem of course is how long a time period is required-the same problem confronted Long Term Capital Management- and they went bust waiting!



Key Empirical Issues: Spreads and Yield Curves

Spread Trading Requires that a “Long Term” Relationship Exists between the series

The statistical tool that enables us to do this is called cointegration (not just correlation)

Cointegration techniques can be used to measure the presence of a long term equilibrium between two securities over time

Error Correction and other econometric models can then be used to assess the effect over time of one time series on another-this enables us to identify what “drives” a spread



Key Empirical Issues: Spreads and Yield Curves Estimating Long Term Relationships

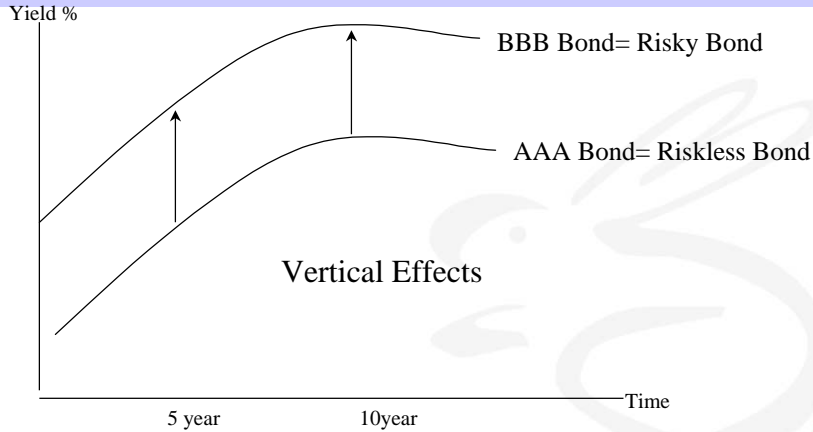
Consider a system comprising bonds of different credit ratings and maturities. One can identify possible bivariate cointegrations involving:

- (a) Bonds of the same maturity but with different credit quality (vertical effects)
- (b) Bonds of the same credit quality but with different maturities (horizontal effects)
- (c) Bonds of different maturity and different credit quality (diagonal effects)

But which of these are important in terms of pricing?

Key Empirical Issues: Spreads and Yield Curves Estimating Long Term Relationships

(a) Bonds of the same maturity but with different credit quality (vertical effects)
eg. Hedging a 5-year corporate bond with a 5-year T-Bond futures contract



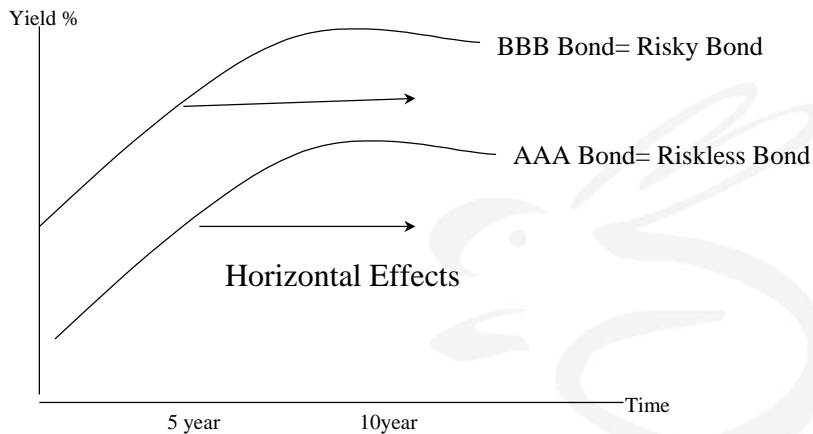
Asian Bond Market Development

we are "Chief of the Rabbits"



Key Empirical Issues: Spreads and Yield Curves Estimating Long Term Relationships

(b) Bonds of the same credit quality but with different maturities (horizontal effects)
eg. Hedging a 3 year T-Bond with a 10-year futures contract



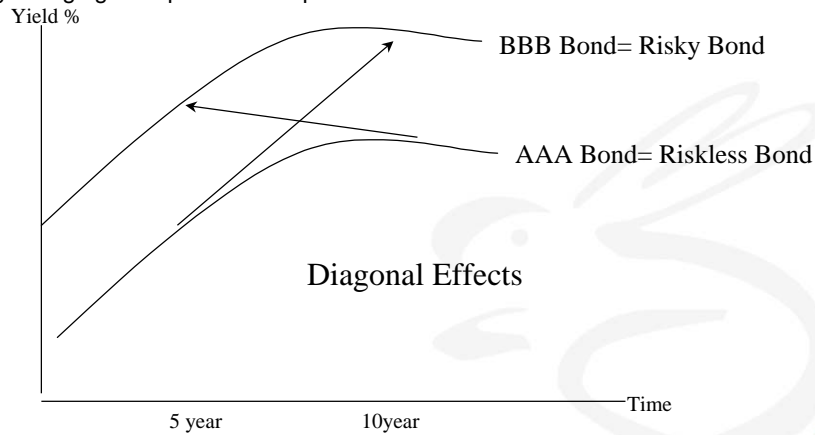
Asian Bond Market Development

we are "Chief of the Rabbits"



Key Empirical Issues: Spreads and Yield Curves Estimating Long Term Relationships

(c) Bonds of different maturity and different credit quality (diagonal effects)
eg. Hedging a corporate bond portfolio with a futures contract of different maturity



Asian Bond Market Development

we are "Chief of the Rabbits"



Key Empirical Issues: Spreads and Yield Curves Estimating Long Term Relationships: BHF (2005)

To investigate the yield spread between the sovereign bonds issued in international markets by major Asia-Pacific issuers (China, Korea, Malaysia, Philippines and Thailand) and various benchmark US Treasury bonds (2, 5, 10 and 30 year maturities)

- Extends earlier BFH (2002-AsER) study which was limited to Thailand only
- Later build a model to determine the extent that various theoretical (and macroeconomic) factors, including interest rate and asset factors, affect changes in credit spreads (BHF, 2006).

Asian Bond Market Development

we are "Chief of the Rabbits"



Key Empirical Issues: Spreads and Yield Curves

Estimating Long Term Relationships: BHF (2005/6)

We consider the following set of bonds-we are limited in choice by price availability in the secondary market

Issuer	Code	Coupon	Issued	Maturity	Rating	Price	YTM	Modified Duration
CHINA, PEOPLE'S REPUBLIC OF	CHG08	7.3	12/9/1998	12/15/2008	BBB	118.41	3.928	5.017
CHINA, PEOPLE'S REPUBLIC OF	CHU06	7.75	7/1/1996	7/5/2006	BBB	115.52	3.327	3.266
CHINA, PEOPLE'S REPUBLIC OF	CHU04	6.5	2/2/1994	2/17/2004	BBB+	105.43	2.472	1.319
FEDERATION OF MALAYSIA	MYG09	8.75	5/27/1999	6/1/2009	BBB-	123	4.692	5.116
KOREA, REPUBLIC OF	KOG08	8.875	4/7/1998	4/15/2008	A-	124.14	3.978	4.385
PHILIPPINES, REPUBLIC OF	PHU24	9.5	10/14/1999	10/21/2024	BB+	108.8	8.602	9.286
PHILIPPINES, REPUBLIC OF	PHG19	9.875	1/6/1999	1/15/2019	BB+	99.25	9.965	7.834
PHILIPPINES, REPUBLIC OF	PHG08	8.875	4/2/1998	4/15/2008	BB+	105.3	7.681	4.197
THAILAND, KINGDOM OF	THU07	7.75	4/10/1997	4/15/2007	BBB-	115.46	3.994	3.772

Note: YTM is the ISMA yield to maturity of the bond. The designation "G" or "U" in the bond code refers to whether the bond was a global bond (G), or a Yankee bond (U).
Source: Reuters Fixed Income Database

Asian Bond Market Development

49

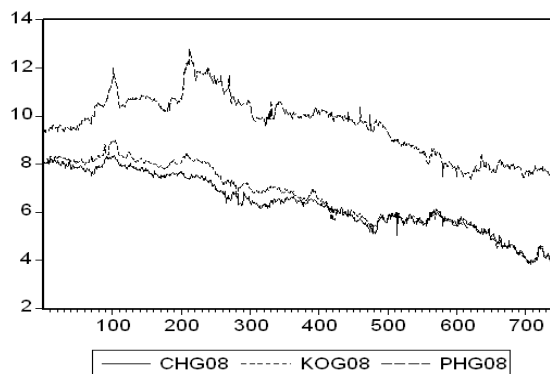
we are "Chief of the Rabbits"



Key Empirical Issues: Spreads and Yield Curves

Estimating Long Term Relationships: BHF (2005/6)

Figure 1: Plot of the yield of three international bonds issued by China, Korea and the Philippines 30 December 1999 to 28 November 2002- note that while the trend was down that the bonds did not necessarily move up and down together



Asian Bond Market Development

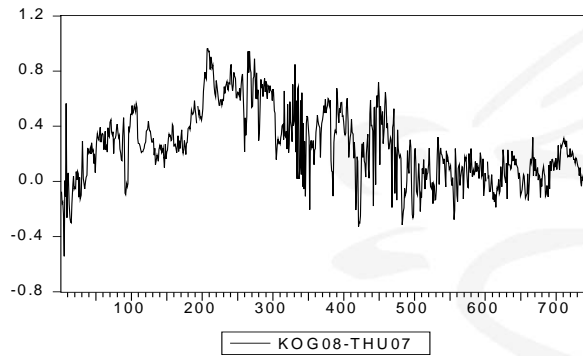
50

we are "Chief of the Rabbits"



Key Empirical Issues: Spreads and Yield Curves

Estimating Long Term Relationships: BHF (2005)
Plot of the spread between the Korea (A-) and Thailand (BBB-) Global 2008 maturity bond



Asian Bond Market Development

we are "Chief of the Rabbits"

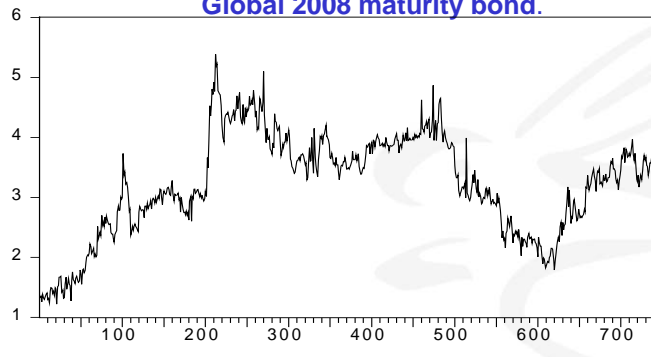


51



Key Empirical Issues: Spreads and Yield Curves

Estimating Long Term Relationships: BHF (2005/6)
Plot of the spread between the Philippines (BB+) and China (BBB) Global 2008 maturity bond.



Asian Bond Market Development

we are "Chief of the Rabbits"



52

Key Empirical Issues: Spreads and Yield Curves Estimating Long Term Relationships: BHF (2005)

- There were 78 (13 by 12/2) possible combinations comprising 6 different pairs of US benchmark bonds, 36 pairs of bonds between US bonds and Asian bonds, and 36 different pairs of Asian bonds.
- Of the 78 possible bond pairs, only 34 (43.5%) were cointegrated at the 5% level.
- Of these 34 cointegrating pairs, 3 were between different pairs of US benchmark bonds (3/6 or 50%), a result which is inconsistent with the Expectations Hypothesis; thirteen were between Asian bonds and US bonds (13/36 or 36.1% of all possible combinations and
- 18 were between pairs of Asian bonds (18/36 or 50.0% of all possible combinations).
- The highest number of pairwise combinations was between the US 2 year benchmark (US2), which was cointegrated with all 12 other bonds. The other US bonds were generally not consistently cointegrated with any particular class or group of bonds.



Key Empirical Issues: Spreads and Yield Curves

Estimating Long Term Relationships: BHF (2005)

Of the 78 possible bond pairs, only 34 (43.5%) were cointegrated

Bivariate cointegration between pairs of bonds comprising Asian international bonds and US Treasury benchmark bonds

	CHU04	CHU06	CHG08	KOG08	MYG09	PHG08	PHG19	PHU24	THU07	US2	US5	US10
CHU06	25.50**											
CHG08	29.28**	36.75**										
KOG08	35.40**	24.86	28.81*									
MYG09	30.45**	38.11**	40.81**	27.81*								
PHG08	22.26	16.43	17.42	21.60	20.24							
PHG19	23.49	16.67	18.09	20.08	19.71	34.81**						
PHU24	25.65*	18.02	19.09	23.01	22.31	39.73**	26.97*					
THU07	32.93*	28.41*	53.08**	38.00**	41.82**	19.28	17.42	20.87				
US2	61.35**	60.44**	56.78**	57.64**	61.87**	48.39**	49.20**	50.32**	51.66**			
US5	25.76*	19.76	24.69	22.32	21.79	15.82	17.11	19.46	17.45	53.99**		
US10	33.17**	23.86	24.41	28.47*	29.13*	20.46	20.49	22.55	22.39	56.36**	15.89	
US30	24.02	17.88	17.78	22.04	23.16	17.07	15.92	19.22	17.42	53.99**	12.40	16.63

Notes: Johansen Cointegration Test at 4 lags, Critical levels *5% (25.32), 1% (30.45)



Key Empirical Issues: Spreads and Yield Curves Estimating Long Term Relationships: BHF (2005)

- The results from cointegration analysis suggest that the equilibrium relationship holds between pairs of bond of similar credit rating –but not necessarily maturity.
- The implication of this result is that there are definite limitations to the market approach for pricing and managing the risk of Asian bonds in international portfolios using duration matching

Asian Bond Market Development

we are "Chief of the Rabbits"



Key Empirical Issues: Spreads and Yield Curves Credit Spread Models: BHF (2006)

New theoretical developments in the valuation of risky debt and credit spread behaviour – very relevant for risky, emerging market issuers

First proposed by Longstaff and Schwartz (JF, 1995), predict a negative correlation between changes in default-free interest rates, the return on risky assets and changes in credit spreads.

Collin-Dufresne, Goldstein and Martin (JF, 2001) expand the range of independent variables to include variables for general macroeconomic uncertainty

Asian Bond Market Development

we are "Chief of the Rabbits"





Key Empirical Issues: Spreads and Yield Curves

Credit Spread Models: BHF (2006)

- $\Delta S = a + b\Delta Y + c\Delta(Y_{30}-Y_2) + d(\Delta Y)^2 + e\Delta I + f\Delta e + g_1\Delta S_{(t-1)} + g_2\Delta S_{(t-2)} + \dots + h_1\varepsilon_{(t-1)} + h_2\varepsilon_{(t-2)} + \dots$
- ΔY_t is the change in the risk free interest rate (identical in maturity to the riskless bond used to calculate the spread),
- $\Delta(Y_{30}-Y_2)_t$ is the change in the slope of the yield curve,
- $(\Delta Y)^2_t$ is the change in the squared spot rate (rates with the same maturity as the riskless bond),
- ΔI_t is the change in the logarithm of the stock market index, and
- Δe_t is the change in the spot exchange rate.
- The autoregressive terms ΔS_{t-n} , for $n = 1, 2, 3$ represent the lagged dependant variable, while the moving average terms ε_{t-n} , for $n = 1, 2, 3$ represent the lagged residual.

Asian Bond Market Development

we are "Chief of the Rabbits"



57



Key Empirical Issues: Spreads and Yield Curves

Credit Spread Models: BHF (2006)

- The first four coefficients (b, c, d, e) in this regression are expected to be negative. The explanation that $e < 0$ is non-controversial and an intuitive explanation lies with the solvency ratio (from the Longstaff and Schwartz model). Thus when a firm's value increases the probability of default falls.
- The negative value for b and $d\Delta Y^2$ (which accommodates potential non-linear effects due to bond convexity) is due to the increase in the drift of the risk-neutral process for V . As interest rates increase, the risk-neutral probability of default is reduced.

Asian Bond Market Development

we are "Chief of the Rabbits"



58



Key Empirical Issues: Spreads and Yield Curves

Credit Spread Models: BHF (2006)

- The coefficient c which represents the slope of yield curve, is expected to be negative ($c < 0$) due to the effect on the recovery rate of changes in economic activity-as the economy moves into recession, as evidenced by a decline in the steepness of the yield curve, credit spreads should increase.
- The coefficient f focuses on the level of macroeconomic uncertainty induced by the exchange rate, proxied by the respective USD exchange rate. This is expected to be positive ($f > 0$), since an increase in uncertainty will also lead to an increase in the potential default of the firm.



Key Empirical Issues: Spreads and Yield Curves

Credit Spread Models: BHF (2006)

Table 3: Panel A: Regressions of changes in credit spreads of Asian international issues on U.S. Treasury (Benchmark) bonds

Pair	Mean Equation						ARMA(3,3) terms						Variance equation: GARCH(3,3) terms						
	a	bAY	$cAY_{30}Y_{12}$	dAY^2	eM	$f\Delta e$	$g_1\Delta S_{1,t}$	$g_2\Delta S_{2,t}$	$g_3\Delta S_{3,t}$	$h_1\epsilon_{1,t}$	$h_2\epsilon_{2,t}$	$h_3\epsilon_{3,t}$	α	$\beta_1\epsilon_{1,t}$	$\beta_2\epsilon_{2,t}$	$\beta_3\epsilon_{3,t}$	$\gamma_1\sigma_{1,t}^2$	$\gamma_2\sigma_{2,t}^2$	$\gamma_3\sigma_{3,t}^2$
CHU04-US2	-0.004 0.002	-1.234 0.000	0.107 0.026				-0.877 0.000	-0.447 0.000	0.372 0.000	0.551 0.000		-0.659 0.000	0.000 0.000	0.380 0.000			0.694 0.086		
CHU06-US5	-0.005 0.000	-2.242 0.000	0.319 0.000	0.099 0.000	0.363 0.010		-0.879 0.000	0.309 0.000	-0.341 0.000	0.778 0.000	-0.638 0.000		0.071 0.098	0.421 0.081					
CHU08-US5	-0.007 0.000	-2.458 0.000	0.157 0.000	0.063 0.000			-0.554 0.005		-0.453 0.009	0.485 0.027	-0.303 0.045	0.003 0.000	0.463 0.000						0.191 0.000
KOG08-US5	-0.006 0.001	-2.520 0.000	0.157 0.000	0.067 0.000			0.833 0.000	-1.029 0.000	0.646 0.000	-0.928 0.000	1.075 0.000	-0.795 0.000	0.001 0.000	0.100 0.005	0.293 0.000			0.373 0.000	
*MYG09-US5	-0.001 0.002	-0.681 0.000	0.046 0.000	0.016 0.000									0.000 0.000	0.567 0.000	-0.379 0.018		0.882 0.000		-0.158 0.044
*PHG08-US5		-0.412 0.000			-0.206 0.000	0.217 0.033	-1.175 0.041			0.974 0.087			0.000 0.000	0.142 0.000	0.092 0.002	0.119 0.000	-0.188 0.002	-0.284 0.000	0.732 0.000
PHG19-US10		-3.639 0.000						-0.512 0.000	-0.374 0.002		0.529 0.000		0.013 0.000	0.206 0.000	0.374 0.000	0.262 0.000		0.301 0.000	-0.146 0.000
PHU24-US10	-0.003 0.057	-3.726 0.000			-0.479 0.001	0.702 0.037							0.002 0.000	0.233 0.000	0.367 0.000				-0.083 0.000
THU07-US5	-0.005 0.001	-2.389 0.000	0.110 0.072	0.084 0.000			-1.153 0.000			0.785 0.000		-0.338 0.002	0.000 0.000	0.289 0.000	-0.237 0.002		0.813 0.000	0.659 0.000	-0.513 0.000

Notes: This table reports the regression from a GARCH(3,3) specification of the regression models $\Delta S_{i,t} = a + bAY_t + cA(Y_{30}Y_{12})_t + d(AY_t)^2 + e\Delta L_t + f\Delta e_t + g_1\Delta S_{1,t} + g_2\Delta S_{2,t} + g_3\Delta S_{3,t} + h_1\epsilon_{1,t} + h_2\epsilon_{2,t} + h_3\epsilon_{3,t} + \alpha + \beta_1\epsilon_{1,t}^2 + \beta_2\epsilon_{2,t}^2 + \beta_3\epsilon_{3,t}^2 + \gamma_1\sigma_{1,t}^2 + \gamma_2\sigma_{2,t}^2 + \gamma_3\sigma_{3,t}^2$



Key Empirical Issues:

Spreads and Yield Curves

Credit Spread Models: BHF (2006)

- The interest rate factor (ΔY_t) was statistically and economically significant in all 9 cases. The coefficient was negative and this result is consistent with the results of other researchers including Longstaff and Schwartz (1995).
- The variable to accommodate the change in the shape of the yield curve yield curve ($\Delta(Y_{30}-Y_2)_t$) was statistically significant in 7 of the 9 cases- the 2 exceptions being the Philippine bonds. The sign was positive in all cases and the economic value of the coefficient was no less than 10% of the size of the interest rate variable. The positive sign suggests that a steepening of the yield curve-due to expectations that the rate of future inflation will rise- results in a rise in the credit spread.
- The adjustment to accommodate possible convexity in the yield curve (ΔY^2_t) was statistically significant in 5 of the 9 cases. However, the actual coefficient was small and generally not economically significant.

Asian Bond Market Development

61
we are "Chief of the Rabbits"

Key Empirical Issues:

Spreads and Yield Curves

Credit Spread Models: BHF (2006)

- Interestingly, the asset factor (ΔI_t) was only significant in 3 of the 9 cases, although it was negative in 2 cases and positive in the remaining one. A positive relationship suggests that a rise in the stock market is associated with an increase in the spread. This result is inconsistent with theory, however one possible explanation concerns possible rebalancing between bonds and stocks held by international portfolio managers.
- In the regressions involving 2 of the 3 Philippines bonds, the stock index variable was negative and also economically significant. This suggests that changes in credit spreads are negatively related to changes in the stock market index. This result-consistent with theory-is an important result for emerging market issuers with non-investment grade credit ratings.

Asian Bond Market Development

62
we are "Chief of the Rabbits"



Key Empirical Issues: Spreads and Yield Curves

Credit Spread Models: BHF (2006)

- The exchange rate variable (Δe_t) was not significant with the exception of Philippine bonds where for 2 of the 3 possible regressions the value was positive and of a scale consistent with the stock index variable. This suggests that a rise in the exchange rate (a depreciation of the peso) was also associated with an increase in the credit spread and a fall in the stock index.
- The complexity of the dynamics of the change in spreads is evident from the fact that 7 of the 9 of the regressions required an ARMA adjustment
- GARCH effects significant. The size of the β and γ coefficients were not of a similar order suggesting that past and forecast volatility have a dissimilar effect on the prediction of variance.

Key Empirical Issues: Spreads and Yield Curves

Modelling Long Term Relationships + Credit Spread Models:

BFH (2005/6) Summary of earlier results:

Equilibrium relationship holds only between pairs of bonds of equivalent credit status-not consistent with expectations theory

Model suggests credit spreads of the sovereign bonds are negatively related to interest rates on US benchmark bonds and positively related to a upward sloping yield curve

The asset and exchange rate variables were only significant for spreads on (lowest risk) Philippine bonds where it was negatively related to changes in the local stock market index, and positively to changes in the exchange rate.

Note the limitations to simple ARMA/GARCH models due to autocorrelation and explosive volatility terms



Empirical Issues: Implications and ongoing concerns

- Credit and interest rate factors as main theoretical drivers of spread changes
- A range of macroeconomic variables as drivers of spread changes may be important-but which ones (WHB,2005)
- How do we control for volatility in asset markets and inefficiencies (eg GARCH, autocorrelation)
- How we measure credit spreads matters-consider riskless bonds of different maturities to capture diagonal as well as vertical effects (see PHB, 2006)
- Hedging / portfolio management given limited product maturities and unstable LT equilibrium (see PHB, 2006)

Asian Bond Market Development

we are "Chief of the Rabbits"

65



Conclusions: Policy and Empirical Issues

- Policy issues related to bond market development will remain a critical issue for government and the non-government sector going forward
- Credit spreads and their construction are a vital measure
- Limited academic empirical or theoretical research into
 - theory underpinning credit spread movements (term structure, equilibrium and asset pricing)
 - practical problem of modelling credit spreads using proxies for different risk measures etc.
 - since spreads are time varying –few documented studies involving credit spreads (eg. Standard event study issues)
 - empirical studies outside of major markets (problem of reliable data and markets to begin with)

Scope for further empirical work in all of these areas.

Asian Bond Market Development

we are "Chief of the Rabbits"

66





Further references and papers available:

Brown, Kym, Batten, Jonathan A. and Skully, Michael T., "Financial Development in the Asia-Pacific Region" (March 16, 2006). Available at SSRN: <http://ssrn.com/abstract=891607>

Pynnönen, Seppo, Warren P. Hogan, Jonathan A. Batten, "Dynamic equilibrium correction modelling of yen Eurobond credit spreads," February 2006, IIS Discussion Paper No. 127
<http://www.tcd.ie/iis/pages/publications/discussionpapers/IISDP127.php>

Batten, Jonathan A., Fetherston, Thomas A. and Hoontrakul, Pongsak, "Modelling the Credit Spreads and Long-Term Relationships of Thai Yankee Bond Issues" (May 7, 2002). Available at SSRN: <http://ssrn.com/abstract=361620>

Batten, Jonathan and Francis In (forthcoming 2006) "Dynamic Interaction and Valuation of Quality Yen Eurobonds in a Multivariate EGARCH Framework". Applied Financial Economics.

Batten, Jonathan, Thomas Fetherston and Pongsak Hoontrakul (2006) "Factors Affecting the Yields of Asian Issues in International Bond Markets". Journal of International Financial Markets, Institutions and Money 16(1): 57-60.

Batten, Jonathan, Warren Hogan and Niklas Wagner, (2005) "Interest Rates, Stock Market Returns, and Variations in German Credit Spreads." Economic Notes, 34(1): 35-50.

Batten, Jonathan, Warren Hogan and Gady Jacoby (2005) "Measuring Credit Spreads: Evidence from Australian Eurobonds". Applied Financial Economics, 15(9): 651-666.

Batten, Jonathan, Thomas Fetherston and Pongsak Hoontrakul, (2005), "A Note on the Equilibrium Relationships between Issuers in the Asia Pacific Region", in Jonathan A. Batten and Thomas A. Fetherston, Editors, Asia Pacific Financial Markets in Comparative Perspective: Issues and Implications for the 21st Century, Contemporary Studies in Economics and Financial Analysis, Volume 87: 167-176, Elsevier Science, Amsterdam Netherlands

Batten, Jonathan and Vincentu Covrig (2004) "The Japan Premium and the Floating- Rate Yen Euromarket", Journal of the Asia-Pacific Economy, 9(3): 288-300.

Batten, Jonathan, Thomas Fetherston and Pongsak Hoontrakul (2002) "Modelling Emerging Market Issues in International Bond Markets: Evidence from Thailand", Asian Economic Journal, 16(4): 379-397.

we are "Chief of the Rabbits"

