Price Discovery in the Trinidad and Tobago Fixed-Rate Government Bond Market: A Preliminary Study

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2.0 RATIONALE

The primary objective of this paper is to present a preliminary analysis of the price discovery (PD) process in the Trinidad and Tobago fixed-rate government bond market and the efficacy of the single-price auction system vis-à-vis price discovery.

This study is motivated by the theory that efficient price discovery processes are central to efficient capital markets which contribute to economic growth (King and Levine, 1993).[1]. In addition, an efficient and transparent government bond market is widely accepted as the starting point for financial sector and capital market development in nascent markets since government is usually the largest borrower and responsible for the implementation of the necessary institutional framework (Masci and Rowland, 2003). Despite the debate[2] on whether securities markets are inherently inefficient relative to price discovery, the literature has established relationships among price discovery, market microstructure and information - both symmetrical and asymmetrical - (Madhavan, 2002).

This report is structured as follows:

1. A review of the literature on the relationships between/among market microstructure, price discovery and information (public and private) in government securities markets as well as government's role in the development of efficient market structures.

2. An outline of some of the main theoretical models used to explain investor behaviour vis-à-vis expectations of securities' yield-to maturity. Their validity in explaining dealers/brokers' bid prices for fixed-rate government bonds is examined.

3. A detailed description of the evolution and structure of the local bond market with particular emphasis on major developments in the last five years.

4. A presentation of the main findings to pinpoint the price discovery process and to determine the efficiency of the single-price auction system.

5. Conclusions

[1] King and Levine (1993) used data for 80 countries between 1969 and 1989 which support Joseph Schumpeter's argument that financial development can promote economic growth.
[2] This refers to the empirical studies conducted after the 1987 crash of the US stock market; these studies challenged the Efficient Market Hypothesis (EMH) which purported that securities markets efficiently reflect information about specific securities and the market in general.

3.0 METHODOLOGY

The paucity of empirical studies on the price discovery process in the Trinidad and Tobago bond market resulted in a heavy reliance on primary data for this exercise. Questionnaires comprising open and closed-ended questions were administered during face-to-face interviews with representatives of the Ministry of Finance, Central Bank of Trinidad and Tobago, Trinidad and Tobago Unit Trust Corporation and Caribbean Money Market Brokers (refer to Appendices I to III for the survey instruments).

Questionnaires were administered to senior officers of the Central Bank and Ministry of Finance to:

- Identify key regulatory changes within the last five years,
- Outline the existing trading mechanism and its efficacy relative to the authorities' objectives,
- Identify the main roles and responsibilities of key supervisory/regulatory agencies and the relationship among agencies,
- Identify changes in bond contracts in the last five years,
- Identify the main use of funds borrowed by central government and quasi-government agencies via the bond market.

Interviews were also conducted with Government Securities Intermediaries to:

- Describe the government bond market microstructure,
- Provide their perspective on the role of regulatory/supervisory agencies,
- Identify intermediation costs,
- Compare price discovery in the underwriting system versus PD in the single-price auction system,
- Outline, as far as possible, their strategy for bid pricing,
- Describe changes in bond contracts and their impact on institutions' pricing strategies.

In addition, a study of literature on market microstructure[3] and price discovery, developments in emerging securities markets and the evolution of the Trinidad and Tobago government bond market, inter alia, were undertaken.

[3] For the purposes of this report, 'microstructure' refers to the organization of a securities market with respect to order handling, trading mechanism, transparency, the role of intermediaries, clearing and settlement, regulatory, supervisory and institutional frameworks.

4.0 LITERATURE REVIEW

This review focuses on the microstructure literature[4] of the last ten years in relation to:

- Government's role in developing efficient market structures.
- Price formation[5]/discovery and trading mechanisms in periodic versus continuous markets,
- The impact of public and private information on PD in government securities markets, government securities markets;

The basic interest rate anticipation strategy and yield curve strategies (term structure of interest rate theories) are also reviewed in relation to portfolio management strategies.

4.1 Government's role in developing efficient market architectures

Well-developed capital markets enable efficient allocation of financial resources and contribute to economic growth (Wurgler, 2000). For nascent markets, government leadership in bond market development is critical (Masci and Rowland, 2003), (Reinstein, 2002) since government is often the single largest borrower in the market. In addition, government bonds provide the 'backbone' of fixed-income securities markets by contributing to the formation of benchmark yield curves and overall credit curves[6].

In Latin America and the Caribbean, government bond markets are considered 'pillars of domestic capital markets which can create and maintain liquidity at critical points along the yield curve by developing benchmark instruments. Intervention can also facilitate the development of derivative markets which are important for investment risk management (Masci and Rowland, 2003). Reinstein (2002) views government bond issues as a public good that is critical for the development of the corporate bond market since it 'demonstrates the potential of a new capital market or a new financial instrument with its own example'.

Masci and Rowland (2003) have proffered 'positive' and 'defensive' reasons in support of the development of efficient capital markets[7] in Latin America and the Caribbean. Included in the 'positive' reasons are: efficient resource allocation, greater informational efficiency, and economic stability while the 'defensive' reasons include: the development of sound macro-economic and financial policies and practices which are necessary though not sufficient to avert crises such as the Asian crisis of 1997/1998.

Transformation of nascent markets into well-developed markets could be undertaken using the four-step approach articulated by the Asian Development Bank (2005) publication *Development of Domestic Bond Markets – Compendium of Sound Practices*:

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[4] The market microstructure literature focuses on 'the study of the process as well as the results of exchanging assets under explicitly specified trading mechanisms'. The literature posits that the pricing of assets cannot be determined independently from the organization and mechanics of trading (Dattels,1995).

[5] The process through which prices incorporate new information (Madhavan, 2002)

[6] World Bank, IMF, *Developing Government Bond Markets A Handbook* (2001)

[7] Masci and Rowland, *Developing Bond Markets in Latin America and the Caribbean*, 2003

Step 1: Consensus Building – via discussion among government, monetary authorities and market participants on the role of the bond market and debt management, macroeconomic policies. The development strategy should also be discussed at this stage.

Stage 2: Establishment of a primary market for government securities by starting with the development of the Treasury Bill market and moving along the maturity spectrum to long-term instruments. This should be closely tied to government's sovereign debt management programme and the Central Bank's Open Market Operations.

Stage 3: Development of a secondary market for government securities to enhance market liquidity by refining the legal and regulatory framework, clearing and settlement systems and the market for repurchase agreements.

Stage 4: Development of an efficient corporate bond market using credit rating agencies, and addressing tax and other regulatory issues.

The appropriate legal, institutional and regulatory framework in domestic securities market can strengthen investor confidence and achieve efficiency through transparency, interconnectivity and competition (Donaldson, 2003)[8] . Capital market regulation is necessary to protect investors, ensure fairness, efficiency and transparency and reduce systemic risks[9]. Regulation can be centralized or decentralized by the appointment of (i) a single regulator for the entire financial system, (ii) a regular for capital markets alone, or (iii) separate agencies responsible for regulation and supervision (Reinstein, 2002). An analysis of decentralized vs centralized approaches suggest the latter is more efficient with respect to the rapidity with which regulatory changes are implemented in response to changes in the market. Madhavan (2002) cautions that a 'one size fits all' approach to regulation and policy making since, he argues, greater transparency does not always improve liquidity in the market. As the market transitions from nascent to well-developed markets Dattels (1995) recommends the establishment of 'transitional and supporting arrangements' by authorities whose role is expected to diminish as the market evolves.

4.2 Price formation/ discovery: periodic versus continuous trading mechanisms

Trading activities are heavily influenced by the type of order flows within markets. Dattels (1995) developed a typology of government securities markets based on types of order flows: periodic versus continuous. The model outlines the trading mechanism based on order flows. In periodic markets trading occurs at periodic or discrete intervals whereas in continuous markets occurs continuously.

[8] William H Donaldson, Chairman of the US Securities and Exchange Commission, *Testimony Concerning Market Structure Issues*, October 2003.

[9] International Organization of Securities Commissions, "Objectives and Principles of Securities Regulation", February 2002

In **periodic markets** at the auction time, batched orders are executed at a single price. Dattels (1995) characterizes periodic market in terms of:

i. The consolidation of orders at a single trading session which serve to deepen the market, stabilize the price and enhance liquidity;

ii. The absence of intermediation costs which result in low transaction costs and economies of scale result from the centralized market structure;

iii. A single price system leads to simpler clearing and settlement procedures and lower costs;

iv. Since market participants receive the same treatment, there is a high degree of transparency which adds to market integrity;

Within the periodic market structure price discovery varies depending on the type of auction mechanism in effect: sealed-order call auction versus open outcry call auction. With a passive auctioneer in the sealed-order call auction, the auctioneer 'determines' the market trading price by combining orders to find the market clearing price. In this scenario, the price discovery system is referred to as a 'black box' since market players have no knowledge of other players' prices until after the auction. The main drawback of this system is price volatility since an imbalance in orders could cause price changes although the fundamental value of the security has not changes. The advantage of this system is that it prevents collusion among market players. Conversely, an active auctioneer (e.g. Central Bank or the Ministry of Finance) intervenes in the auction in an attempt to influence prices. Usually this is in an attempt to achieve price stabilization or to achieve prices compatible with monetary policy.

In open outcry call auctions that are floor-based price discovery is based on a re-contracting auction which allows traders to submit trial prices until and agreement is reached among them on the final prices. This is interactive and therefore opposite to the 'black box' approach. This approach is said to result in prices that are closer to the equilibrium values of securities traded. In the electronic call auction, the number of traders can be significantly increased via electronic systems which provide information on prices and orders as well as the ability to submit new orders as new information comes to hand.

Price discovery in the **continuous system** is impacted by variations in the role of players and trading mechanisms at work. Continuous markets possess the following characteristics:

- Continuous price discovery
- Instantaneous execution of trades
- Trading strategies that allow for flexible management

Market structure design is influenced by order flows which inform trading mechanisms selected by monetary authorities. The literature suggests that while one structure is not necessarily superior to another, the 'ideal' structure allows for efficient price discovery and the creation of deep and liquid bond markets[10]. Dattels (1995) argues that efficient structures are a function of the "institutional characteristics" of the national market. In addition, empirical evidence suggests that different market architectures serve different segments within a single capital market. Madhavan (2002) describes an efficient "structure" as one which yields the highest liquidity and lowest transaction costs although he points to automation as being the "most influential factor" in turning orders into transactions.

4.3 Information and Price Discovery

According to the Efficient Market Hypothesis (EMH), in efficient markets the price of a security is based on all available information and thus accurately reflects the security's intrinsic value. From the 1970s to 1987 the EMH was the dominant hypothesis and capital markets were depicted as inherently efficient relative to the incorporation of news/information in the price formation process (Fama, 1970). Empirical studies after the 1987 crash of the US stock market challenged the EMH and revealed a weak correlation between the release of public information and securities prices; the newer hypotheses pointed to inherent inefficiencies in capital markets (Rozeff and Kinney, 1976; Russel and Torbey, 2002). In subsequent studies psychological and behavioural factors were identified as other influencers of securities prices (Madhavan, 2002).

Empirical studies on PD in government securities markets have been conducted for developed economies in which continuous trading occurs. One of the most recent studies was done by Inoue in 1999 and entailed a comparative study[11] of price discovery processes in the US, UK, Japan, Italy and Canada. The depth and liquidity of these markets allowed for intraday and intraweek patterns to emerge as well as comparison of informational efficiency in equities, foreign exchange and government securities markets. It was found that that the price discovery process differs based on the kind of security that is traded.

The author identified public and private information as influencers of government securities in the US, the UK, Japan, Italy and Canada. Government securities prices were mostly affected by public information given that the discount rate was the most important variable (in the PD process) and was affected by announcements of macroeconomic data, open market operations and policy rate changes. These announcements were considered symmetrical information since all market participants were privy to the information at the same time.

[10] Dattels (1995) argued that "choosing a market structure is shown to depend on the institutional characteristics of the market".

[11] It should be noted that these are developed markets in which the PD process is different for nascent markets. The difference is discussed in the 'Findings' section of this study.

The study revealed that private information such as order flow[12] and trading intentions of large customers had a lesser impact on prices than pubic information. Private information is asymmetric in nature since not all market participants would be privy to the information or, if they were, not at the same time.

Inspite of the obvious differences between the markets in Inoue's (1999) study and nascent markets, his research is significant in identifying the types of information which can influence government bond prices in embryonic markets. The study also points to the speed with which information is incorporated in prices which should also be explored in studies of nascent bond markets.

[12] Inoue's research and references focused on order flows in dealer markets

5.0 AN OVERVIEW OF THE TRINIDAD AND TOBAGO GOVERNMENT BOND MARKET

Evolution of the Financial System

In the IMF's 2006 Financial System Stability Assessment for Trinidad and Tobago, the financial sector was described as having undergone 'rapid structural change over the last decade" as evidenced by changes in its asset composition (shown in Table 2 below.

Table 2: Asset Composition (%) by type of Financial Institution, Trinidad and Tobago, selected years

Institution	1995	2000	2003
Commercial Banks	**50**	**44**	**38**
Insurance Companies	**14**	**15**	**18**
Finance Companies and Merchant Banks	**5**	**6**	**7**
Trust and Mortgage Finance Companies	**9**	**12**	**10**
National Insurance Board	**8**	**9**	**9**
Unit Trust Corporation	**3**	**6**	**10**
Credit Unions	**6**	**4**	**5**
Development Banks	**2**	**2**	**2**
Thrift Institutions	**0**	**0**	**0**
Home Mortgage Bank	**2**	**1**	**1**
Deposit Insurance Corporations	**0**	**1**	**1**
TOTAL	**100**	**100**	**100**

Source: IMF, Financial System Stability Assessment, 2006

The most obvious change has been the reduced dominance of commercial banks (asset base declining from 50% of total in 1995 to 38% of total in 2003) and the increases in the contribution to total assets by Insurance Companies and Finance Companies and Merchant Banks)

Development of the primary domestic bond market

Compared to the significant growth of financial sector in the last forty years, the domestic bond market has evolved at a much slower pace. Reflecting on the number (as shown in Table 3 below) and composition of placements in the bond market between 1999 and 2004, Central Bank of Trinidad and Tobago Governor, Ewart Williams (2004) noted:

" Over the last five years or so, … {of the total number of bonds registered with the TTSEC] the local quasi-government sector has accounted for about 36 percent , central government issues 18 percent, and regional governments and corporations 40 percent. The local private sector has accounted for less than 10 percent of the bond issues listed."[13]

Table 3: Number and Value of Bonds registered with the TTSEC, 1997 - 2003

Year	Number	Value TTD
1997	1	75,000,000
1998	2	1,365,503,325
1999	21	4,312,586,550
2000	15	2,798,500,199
2001	32	8,005,144,276
2002	14	3,511,123,370
2003	22	6,254,441,165
Total	**107**	**26,322,298,892**

Source: TTSEC, Development of the Securities Market in Trinidad and Tobago, 1997-2003, 2004

In seven years, the total number of placements registered by TTSEC has increased from 1 in 1997 to peak at 32 in 2001 closing off at 22 in 2003. There has been an almost steady increase in the number of placements except for 2000 and 2002. According to the Central Bank data, 35 bonds were placed in 2004 and 37 in 2005. In the same vein, the value of capital raised in the bond market increased from TTD 75MM to TTD 6.25 BN though there were corresponding declines in 2000 and 2002.

There are also trends relative to the par value of bonds issued between 1997 and 2003[14]. There has been a concentration of bonds with a value greater than or equal to TTD 100 MM but less than TTD 250 MM and greater than or equal to TTD 250 MM but less than TTD 500 MM. More than a third of the bonds between 1997 and 2003 had a par value greater than or equal to TTD 250 MM but less than TTD 500MM; the second highest segment relative to par value was greater than or equal to TTD 100 MM but less than TTD 250 MM which accounted for 24% of total issues.

Trends in government and government-guaranteed segment

In keeping with the overall trend, there has been an increase in the number of annual issues of fixed-rate government and government-guaranteed bonds between 1995 and 2004. Central government issues government bonds whereas state enterprises and statutory authorities issue government-guaranteed bond both of which carry the same low risk profile. Fixed-rate issues are captured in Table 4 below.

[13] Ewart Williams, Government of CBTT, June 2004 "Understanding Capital Markets" Address at UWI, Institute of Business, June 2004

[14] Statistics quoted from TTSEC, Development of the Securities Market in Trinidad and Tobago 1997 – 2003, 2004.

Table 4: Number of fixed-rate government and government-guaranteed bonds by tenor, 1995 - 2005

Year of issue	10-year bonds	15 year bonds	20 year bonds	25 year bonds
1995	**-**	**2**	**5**	**1**
1996	**-**	**-**	**-**	**-**
1997	**3**	**-**	**3**	**-**
1998	**-**	**-**	**5**	**-**
1999	**-**	**2**	**1**	**1**
2000	**2**	**2**	**-**	**-**
2001	**1**	**1**	**-**	**-**
2002	**1**	**1**	**3**	**-**
2003	**4**	**3**	**-**	**-**
2004	**-**	**2**	**-**	**-**
2005	**2**	**-**	**-**	**-**
Total	**13**	**13**	**17**	**2**

Source: CMMB Bond Guides, July 2006

In the last ten years issuers of government and government-guaranteed bonds have displayed a preference for 10, 15 and 20 year bonds. No 25-year bonds have been issued by this group since 1999. The data also showed very few issues of bonds with maturity less than 10 years.

While the increase in the number of placements of government bonds over the ten years signalled strong investor confidence in these instruments, the Trinidad and Tobago government bond market is at an embryonic stage largely as a result of its thinness relative to number and frequency of placements and the small number of participants.

Trinidad and Tobago's strong fiscal position in the last five years led to a decline in issues of fixed-rate bonds by the central government. The decline in placements is largely attributable to the performance of the energy sector which has contributed to fiscal surpluses. Whereas in 2003 there were 10 placements, in 2005 there were three placements: March for TTD 400 million[15] at a coupon of 6.0%; In May for TTD202.78 MM at a coupon of 6.10% and in July TTD, and in July for TTD197.2MM at a coupon of 6.10%. In the last five years there have been two Eurobond placements.

Market fragmentation by issuers, maturities and yields

The domestic bond market is fragmented by issuers, tenor, and other features i.e. fixed versus floating rates and, to a lesser extent callable, and zero coupons. This fragmentation underscores the thinness of the market and distorts the price discovery process. Coupons rates by maturity and issuer are depicted in the table 5 and table 6.

[15] Central Bank of Trinidad and Tobago

Table 5: Average Coupon (%) for fixed-rate bonds issued by the Central Government 2000 - 2005

Year	10 year	15 year	20 year
2000	**11.2**	**11.77**	**12.25**
2001	**10.5**	**n.a.**	**n.a.**
2002	**7.5**	**7.75**	**8.5**
2003	**6.02**	**6.34**	**n.a.**
2004	**n.a.**	**6.07**	**n.a.**
2005	**6**	**n.a.**	**n.a.**

Source: CMMB Bond Guide, July 2006

In general, central government's borrowing in the bond market is used for debt management and budget financing (to a lesser extent in the last five years). There is a trend of declining coupon rates between 2000 and 2005.

Table 6: Average coupon (%) for bonds issued by state enterprises And statutory authorities 2000 - 2005

	10 year	**15 year**	**20 year**	**25 year**
2000	n.a	n.a	11.4	n.a
2001	n.a	n.a	11.82	n.a
2002	7.65	n.a	n.a	n.a
2003	7	n.a	n.a	n.a
2004	n.a	6.17	5.85	n.a
2005	n.a	6.35	7	7.75

Source: CMMB Bond Guide, July 2006

Between 2000 and 2001 the preference for 20 year bonds was widened to bonds with tenors ranging from 10, 15 and 20 year bonds. There were single issues for 20 and 25 years in 2005 placed by the National Housing Authority – the only placement of fixed-rate bonds by this government agency in the five year period. The coupon trend is consistent with those exhibited for fixed-rate bonds placed by statutory authorities and state enterprises: from a high average of 11.82% in 2001 for a 20 year issue, the rate declined to 7.0% for a 20-year bond in 2005.

The primary financing objectives met through funds raised by state agencies in the bond market include: financing for infrastructural development e.g. housing, sea ports and airports; infrastructure upgrade; refinancing of high-cost bonds; operating expenses of statutory authorities; and deficit financing for state agencies. Some of the main statutory authorities and state enterprises that have been issuers in the last four fiscal years are listed in Appendix IV

Table 7.0 Local Private Sector placements, 2001 - 2005

Year	Issuer	Maturity (years)/ type	coupon (%)
2001	Courts Trinidad Limited	5	10.5
2001	Ansa McAl Ltd.	15	12.625
2001	Ansa McAl	5 (Zero certificate of interest)	0
2001	Ansa McAl	5 (zero certificate of interest)	0
2001	Scotiabank T&T Ltd	7	0
2002	Angostura Ltd	5	10.5
2002	Home Mortgage Bank	4	7
2002	Home Mortgage Bank	5	6
2002	Home Mortgage Bank	6	8.25
2002	Home Mortgage Bank	10	8
2003	KFC	5	13
2005	Courts Trinidad Limited	3	7.35

Source: CMMB Bond Guide, July 2006

Corporate issuers of fixed and floating-rate bonds account for less than 10 per cent of the issues registered by the TTSEC over the last five years. [16] As shown in Table 7.0 , few local private entities raise debt via bond placements unlike issues by central government and state agencies, there is a preference for bonds with short maturities: six of the 12 placements were 5 year bonds. In addition, coupon rates do not exhibit the trends of Tables 6.0 and 7.0. Two five-year bonds issued in 2002 by different entities attracted coupons of 6% and 10.5%.

Since 1999 regional entities have raised around USD 1 BN through foreign currency bond placements in the domestic fixed-rate bond market (Harripaul, 2005). Three regional entities also floated bonds on the local market in 2004. In 2004, 19 foreign-currency denominated bonds amounted to 54.2% of the total value of funds raised; this represented a 28.4% increase over the value of USD raised in 2003. Of the 17 placements by regional entities 6 were sovereign issues (5 in USD and 1 in XCD). In 2005 of the 37 issues, 11 were denominated in foreign currencies – 9 in US dollars and 2 in Barbadian dollars. Total USD borrowed amounted to USD 0.457 BN of which the Government of Aruba, the sole sovereign issuer in 2005, raised USD93MM. Average coupon rates across maturities issued with respect to regional governments outside of Trinidad and Tobago between 2001 and 2005 are shown in Table 8.0.

[16] Arjoon, Harripaul, Understanding the role of Capital Markets in a Modern Economy, February 2005

Table 8.0: Placements by regional entities 2002 - 2005

Year	Issuer	Maturity (years)/ type	coupon (%) on Non-TT Sovereign bonds	Ave coupon on comparable TT gov't guaranteed bonds (%)
2001	Government of Jamaica	10 (Eurobond)	11.75	10.5
2001	Government of Jamaica	20 (Eurobond)	11.625	n.a.
2001	Government of Barbados	20 (Eurobond)	7.25	n.a.
2001	Government of St. Kitts and Nevis	10	10.5	10.5
2001	Government of St. Kitts and Nevis	10	10.0	10.5
2001	Government of St. Kitts and Nevis	10	10.5	10.5
2001	Government of St. Kitts and Nevis	10	10.5	10.5
2001	Government of St. Kitts and Nevis	10	10.5	10.5
2001	Government of St. Lucia	15	9.9	n.a.
2002	Government of Jamaica (Eurobond)	15	10.625	7.75
2002	Government of Grenada	10 (Eurobond)	9.375	7.5
2002	Government of St. Kitts and Nevis	10	9.0	7.5
2002	Government of St. Kitts and Nevis	10	9.0	7.5
2002	Government of Belize	10 (Eurobond)	9.5	7.5
2003	Government of St. Kitts and Nevis	10	7.5	6.02

Source CMMB Caribbean Bond Guide Issue#10, July 2006

When compared with TT government guaranteed bonds with the same tenor issued in the same year, non-TT Sovereign bonds carried higher coupons, in general. For instance a 10-year fixed rate bond issued by the government of St. Kitts and Nevis in 2002 carried a coupon of 9.0%compared with a 10-year fixed-rate TT government-guaranteed bond which carried a coupon of 7.5%.

Public announcements of macroeconomic performance or monetary policy changes

Trends in bond yields mirror general trends in domestic interest rates which are influenced by international rates (in particular the Fed Fund rate). Inoue's (1999) comparative study of price discovery processes in the US, UK, Japan, Italy and Canada identified public information such as statistical announcements, policy rate changes and Open Market Operations as affecting government securities prices. Public information was considered symmetrical. Inoue (1999) identified private information (asymmetric in nature) such as order flow and trading information as also having an impact on prices but to a lesser extent.

In May 2002 the Central Bank of Trinidad and Tobago began scheduled announcements of its repurchase or 'repo' rate for short-term government paper. On scheduled dates, the Central Bank issues media releases outlining changes in the rate and the underlying factors that contributed to the Bank's position. Table 8.0 outlines changes in the repo rate and some of the underlying factor identified by the Bank. Table 9 below outlines movements in the policy rate and

Table 10, changes in the inflation rate which is closely tied to the repo rate as the Central Bank attempts to contain credit creation. Movements in coupon rates for 10, 15, 20 and 25 year bonds are detailed in Tables 11.1 to 11.4 below.

Table 9: Repo rate changes 2002 - 2005

Date	**Rate change**	**Factors influencing rate change**
May 2002	5.25%	The first repo rate announcement
September 2003	5% - a reduction of 25 basis points	- Subdued credit growth; - 'Soft' commercial bank short-term rates
March 2005	5.25% - increase by 25 basis points	- increase in headline inflation by 0.5% to 5.9% - reduction in differential between short-term TT and US rates from 3.84% (Feb 04) to 1.98% (Feb. 05)
July 2005	5.5% - increase by 25 basis points	- inflationary expectations: headline inflation increased to 6.58% (yoy); core inflation also increasing - reduction in differential between short term TT and US rates
September 2005	5.75% - increase by 25 basis points	- high liquidity: credit expanded by 17% yoy (July 05) - continued falling differential between short-term TT and US rates - inflation: headline inflation increased to 7.3%; core inflation also increasing
November 2005	6.0% - increase by 25 basis points	- high liquidity - continued reduction in TT-US short-term rate differential - inflationary expectations

Sources: Central Bank of Trinidad and Tobago, Media Releases October 2003 – December 2005; Annual Economic Survey, 2003

Table 10: Inflation Rates 1995 - 2005

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Inflation (avg)	5.3	3.3	5.6	3.6	3.5	3.6	5.5	4.2	3.8	3.7	6.9

Source: Central Bank of Trinidad and Tobago, Annual Economic Surveys: 2001 - 2005

The average annual inflation rate declined 5.6% in 1997 to 3.6% in 2000 then peaked at 5.5% in the following year. The upward trend in 2005 continues into 2006. The data shows that the inflation rate and the repo rate move together (and in the same direction).

Table 11.1 Coupons on fixed-rate government and government-guaranteed bonds – 10 year maturity, 1997 – 2005

Issue date	Coupon (%)	Repo rate (%) announcement
8-Aug-97	**9.95**	
2-Sep-97	**9.95**	
30-Nov-97	**9.95**	
1-Mar-00	**11.0**	
8-May-00	**11.3**	
16-May-01	**10.5**	
27-Jun-02	**7.5**	**5.25 (May)**
17-Apr-03	**6.1**	
24-Jun-03	**6.0**	
1-Sep-03	**5.9**	**5.00 (Sept)**
30-Sep-03	**6.08**	
4-Aug-04	**5.55**	
4-Aug-04	**6.87**	
4-Oct-04	**6.18**	
16-Mar-05	**6.0**	**5.25 (Mar)**
24-May-05	**6.1**	
1-May-05	**7.5**	
1-Jun-05	**7.675**	

Source: CMMB Bond Guide July 2006; Central Bank of TT Annual Economic Survey 2005

In the nine year period in Table 11.1 above the highest number of placements in a given year was four in 2003 and 5 and the lowest number was one in 2001 and 2002. Yields peaked at 11% in 2000 up from 9.5% in 1997, dipped to a low of 5.9% in 2003 then rose again to 6.00% to 6.10% in 2005.

Table 11.2 Coupons on fixed-rate government and government-guaranteed bonds – 15 year maturity, 1997 – 2005

Issue date	Coupon (%)	Repo rate (%) Announcement
15-Feb-95	12.1	
17-May-95	11	
7-May-99	11	
7-Oct-99	11.5	
18-Feb-00	11.4	
8-May-00	11.4	5.25 (May)
24-May-01	11.65	
27-Jun-02	7.75	
17-Apr-03	6.4	
1-Sep-03	6.25	5.00 (Sept)
30-Sep-03	6.4	
6-Nov-03	6.2	
22-Sep-04	6.1	
3-Aug-04	6.15	
Jun-05	6.35	5.25 (Mar)
Jun-05	6.225	
Aug-05	6.35	5.5 (July)
Oct-05	6.37	5.75 (Sept)

Source: CMMB Bond Guide July 2006; CBTT Annual Economic Survey 2005

In the ten year period covered in Table 11.2 there were 15 placements of fifteen year fixed-rate government and government-guaranteed bonds. The movement of yields are similar to those for ten-year fixed rate bonds issued between 2000 and 2005: After peaking at 11.65% in 2001, rates ranged from 6.20% to 6.40% in 2003 and declined further to between 6.1% and 6.15% in 2004. There was one placement of a fifteen-year bond in 2005. Like the trend exhibited for 10-year bonds, the highest numbers of placements for a given year was 4 in2003 and one placement in 2001 and 2002.

Table 11.3 Coupons on fixed-rate government and government-guaranteed bonds – 20 year maturity, 1997 – 2005

Issue date	Coupon (%)	Repo Rate (%) Announcement
30-Oct-92	**11.5**	
26-Jan-93	**11.5**	
18-Nov-93	**12**	
5-Sep-94	**11.5**	
15-Feb-95	**12.2**	
31-Oct-95	**11**	
31-Oct-95	**11**	
31-Oct-95	**11**	
27-Jun-97	**11.5**	
27-Jun-97	**11.5**	
27-Jun-97	**11.5**	
26-Jun-98	**11.8**	
16-Jul-98	**11.5**	
16-Jul-98	**11.5**	
26-Nov-98	**11.5**	
26-Nov-98	**11.5**	
12-Mar-99	**11.5**	
18-Mar-02	**11.5**	**5.25 (May)**
24-Sep-02	**7.25**	
30-Sep-02	**6.75**	
4-Dec- 04	**6.185**	
5-Aug-05	**7**	**5.5 (July)**

Source: CMMB Bond Guide July 2006

In the ten year period reviewed relative to twenty-year fixed-rate bonds listed n Table 11.3 above there was a total of twenty placements (an average of 2 per year). Between 1992 and 1999 yields were relatively constant but began to decline in 2002. The highest number of placements were in 1998 – a total of 5 placements with an average coupon of 11.56%; the lowest number of placements was 1 in 1992, 1994 and 1999Like the trends exhibited in Tables 11.1 and 11.2 the downward trend in coupon rates began in 2002 falling from 11.5% to 6.75 within the year.

11.4 Coupons on fixed-rate government and government-guaranteed bonds – 25 year maturity, 1980 - 1999

Issue date	Coupon (%)	Repo Rate (%) announcement*
12-Dec-80	8.75	nil
16-Dec-82	9.75	
16-Oct-83	10	
26-Feb-85	10.25	
15-Nov-85	10.25	
19-Dec-85	10.25	
20-Aug-87	10	
23-Jun-88	10.25	
15-Feb-95	12.2	
30-Dec-99	14.75	

Source: CMMB Bond Guide July 2006

** Central Bank started its system of repo rate announcements in May 2002*

In the nineteen years reviewed in Table 11.4 there were 10 issues: an average of less than 1 per year. A trend of rising rates is exhibited from 8.75 in 1980 to 14.75 in 1999. Because there were no issues after 1999 a comparison with coupons for 10, 15 and 20 year bonds cannot be undertaken relative to coupons. While there were three issues in 1985 there was only one placement for each of the other years.

Secondary Market

The secondary market for government bonds is even thinner than the primary market. Table 12.0 below captures secondary market activity between 1997 and 2005 compared with the primary market. In the secondary market there is trading of stripped bonds/ derivative securities[17] via Over the Counter trading which are not always captured in official statistics. In Trinidad and Tobago bond derivatives are Certificates of Interest or Certificates of Participation. In its review of securities market developments between 1997 and 2003 the Trinidad and Tobago Securities and Exchange Commission noted that 70 credit/debt derivative securities were traded with Citibank/Citicorp group, RBTT Bank and Republic Bank Limited accounting for 94.4% of derivative issues on the market.

There has been modest activity (in number and value) in the secondary market with the number[18] of registered credit/debt derivatives increasing from 3 in 1997 to 21 in 2002; in 2003 15 were registered. State enterprises/statutory authorities and central government respectively held 23% and 21% of the underlying bonds. In the derivatives market 40% were quoted in USD compared with 23% of bonds in the primary market that were quoted in USD between 1997 and 2003.

[17] A derivative is an instrument whose performance is based on the performance of an underlying asset such as a bond. Derivative issues are not new capital.

[18] Source: Development of the securities Market in Trinidad and Tobago, 1997 to 2003, with Prospects for the future, Trinidad and Tobago Securities and Exchange Commission, 2004

Table 12.0 Secondary market turnover – government bonds, 1997 – 2005

Year	Number of transactions (Secondary market)	Face value (TTDMM) (Secondary market)	Face Value (TTDMM) Government Securities **(New Issues)**
1997	15	22.3	1,894.20
1998	4	0.3	1,377.20
1999	14	11.9	904.60
2000	15	19.9	895.40
2001	8	15.3	1,376.00
2002	21	9.63	1,100.00
2003	0	0	2,640.00
2004	0	0	1,120.00
2005	0	0	800.00

Sources: Central Bank of Trinidad and Tobago, Annual Economic Surveys 2000 - 2005

Secondary market activity for government securities as a percentage of primary market activity in terms of face value in any given year ranged from 2.2% in 2000 to 0% in 2003, 2004, 2005. The decline in activity in 2003 - 2005 is possibly the result of unregistered over-the-counter trading of derivatives with government securities as the underlying investment instrument.

Trading Mechanism(s)

Underwriting system

At the launch of the single-price auction system in July 2004, the Central Bank governor, Ewart Williams noted that the existing deficiencies in the bond market "create distortions and prevent our bond markets from making an optimal contribution to our capital market development". He added that the auction system was "the first critical step in a much needed process of reform of the government bond market". To this end, the introduction of the auction system was described as signalling a shift from a "government bond programme simply related to budget financing and debt management" to one that is "explicitly geared to fostering savings and providing economic information to financial markets" (Ewart Williams, 2004)

Prior to the introduction of the single price auction system government bonds and government-guaranteed bonds were allocated via an underwriting[19] process which entailed an 'agreement'[20] between the issuer (central government or

[19] An underwriter guarantees the issuer of the bond to purchase that portion of the issue that is not taken by investors (Trinidad and Tobago Government Bond Market, Pamphlet No.4/2004, Central Bank of Trinidad and Tobago)

[20] Central Bank Governor Williams referred to this agreement as a 'soft' commitment

state enterprises/agencies) and a small number of financial institutions to underwrite a minimum of 75% of each issue which is often 'pre-sold'[21].

The process begins with the issuer (government or state agency) forwarding term sheets to Merchant Banks. Each underwriter/arranger submits to government its proposed structure on the term sheets. Merchant Banks' proposed terms are based on the amount of money to be raised and interest rate expectations, inter alia. Also, included in the term sheets are underwriting and arrangement fees[22]. Usually the Merchant Bank is the arranger while the commercial bank with which it is affiliated is the underwriter.

The issuer, compares 'proposals', and selects the term structure that best suits its needs with respect to the frequency of interest and principle payments, the tenor, call and pre-payment options (if applicable) and other features of the bond. Usually, the cheapest bid is accepted. The Ministry of Finance and the Central Bank provide advice to the statutory authorities/state agencies and the central government relative to assessment of bids. The successful underwriter is informed and settlement takes place on the date agreed between the issuer and the underwriter.

Auction system

One of the most significant developments in the local bond market in the last five years was the introduction of the single price auction system which was expected to improve the efficiency and transparency of the price discovery mechanism as well as to contribute to the development of the secondary market (Ewart Williams, 2004).

The Central Bank oversees the Government Securities Settlement system which comprises settlement, depository and auction functions. The Bank acts as manager (on the government's behalf) as well as registrar and paying agent and is also responsible for the appointment of Government Securities Intermediaries (GSIs) which are approved to purchase bonds competitively and non-competitively.

GSIs are expected to contribute to the deepening of the bond market by stimulating participation, increasing trading activity, and widening the distribution of these securities. Eleven GSIs have been appointed by the Central bank to electronically place competitive bids on their own behalf. Of these eleven, four institutions are also authorized to submit non-competitive bids (a maximum of TTD20,000 per investor) on behalf of members of the general public.

Criteria for selection[23] for GSIs are:

- 'good standing' with their primary regulator and authorization to trade in fixed income securities;

[21] Ewart Williams, Governor of Central Bank of TT, "Understanding Capital Markets" Address at UWI Institute of Business, June 2004

[22] The arrangement fee is for arranging the terms of the bond and the underwriting fee is the insurance that the entire bond will be sold on the date of issue.

[23] Central Bank of Trinidad and Tobago, Trinidad and Tobago Government Bond Market, Government Securities Intermediaries, Pamphlet No.2/2004

- the capacity to participate at auctions;
- a sufficiently large capital base to meet market obligations and requirements set out by the primary regulator;
- a history of strong financial performance;
- strong management and technical teams to manage the attendant trading risks; and
- willing to provide regular reports on government securities market activities.

At present eleven GSIs approved to bid competitively are:

- ANSA Finance and Merchant Bank
- Caribbean Money Market Brokers Limited
- Citicorp Merchant Bank Limited
- CLICO Investment Bank Limited
- First Citizens Bank Limited
- Intercommercial Trust and Merchant Bank
- Republic Finance and Merchant Bank Limited
- Royal Merchant Bank and Finance Company Limited
- Scotiatrust and Merchant Bank (T&T) Limited
- First Caribbean International Banking and Financial Corporation
- Trinidad and Tobago Unit Trust Corporation

The four GSIs approved to submit both competitive and non-competitive bids are:

- Caribbean Money Market Brokers Limited
- Intercommercial Trust and Merchant Bank
- First Caribbean International Banking and Financial Corporation
- Trinidad and Tobago Unit Trust Corporation

It should be noted that insurance companies and the National Insurance Board which are not included on the list of approved GSI's can also submit competitive bids.

With the auction system, a prospectus on the financial instrument is published in the daily newspaper as well as the Central Bank's website. This is done at least one week before the auction date. This is because the auction system has theoretically widened the group of potential investors from the small core of Merchant Banks to eleven appointed GSIs four of which are authorized to submit bids on behalf of the general public[24]. Special conditions apply to non-competitive bids that is, bids from the public: applications must be submitted through a GSI, and a restriction of a maximum limit of TTD20,000 for a single bid is enforced.

Bids must be submitted to the Central Bank on designated application forms by 1:00 pm on the auction date. Each bid must be submitted on a separate form and a minimum bid of TTD5,000 applies. For non-competitive bids, members of the public must submit payment to the GSI with their application forms this enable settlement[25] of non-competitive and competitive bids two business days after the auction date. GSIs are informed of the results of the bid (allotted amounts and cost) by 4:00 pm on auction day.

[24] A maximum of 4% of the issue is allotted to non-competitive bidders (Central Bank of Trinidad and Tobago)

[25] The central bank debits the GSIs' settlement accounts at the Bank

The allotment process involves ranking of bid prices in descending order. The lowest price which allows for the full allocation of the issue becomes the cut off price for successful competitive bidders; this is the same price used for non-competitive bidders for partial or full allotment. The Central Bank has the right to set a minimum bid price acceptable for each auction and bids can be rejected based on this minimum price. If an issue is under-subscribed the Bank can re-issue the unsubscribed portion at the original coupon or the Bank could exercise its right to cancel the auction.

The central bank announces the results of the auction via a press release. Also included in the release is the total amount applied for, the amount allotted, and the yield or price. Bonds are issued in de-materialized form to enable secondary market trading.

The introduction of the auction system did not completely replace the underwriting system. For expediency some state enterprises still go directly to the market usually to raise money quickly.

Institutional Framework

In the last forty years, the domestic financial system has undergone significant developments relative to its institutional framework. Some of the key developments are listed in the table below.

Table 13 Key Institutional Developments in the Trinidad and Tobago Financial System 1965 to 2004

Year	Event	Objectives
1965	Central Bank institutes a Call Exchange	To act as a clearinghouse for shares traded
1970	Formation of a Capital Issues Committee	To oversee the functions of the securities market
1981	Establishment of the Trinidad and Tobago Stock Exchange	To replace the Call Exchange and the Capital Issues Committee. To enhance the efficiency of market transactions
1981	Establishment of the Trinidad and Tobago Unit Trust Corporation	To establish the first Collective Investment Scheme
1995	Securities Industry Act (1995)	To replace the SIA of 1981 and establish the Trinidad and Tobago Securities and Exchange Commission. Also, to harmonise the regulatory framework of the securities industry.
2003	Establishment of the Trinidad and Tobago Central Depository (TTCD) by the TTSE	To enhance security ownership record keeping, and custody of physical certificates; To enhance clearing and payments system
2004	Introduction of the Government Securities System	To replace the underwriting system, deepen the market, enhance transparency and ultimately price discovery.
2004	Establishment of CariCRIS	To promote the development of an efficient bond market by providing information on the credit worthiness of borrowers
2004	Preparation of the White Paper on Financial Sector Reform	To provide the basis of government's reform strategies for the financial sector
2004	Insurance Amendment Act	To transfer responsibility for supervision of insurance companies/intermediaries and pension plans from the Ministry of Finance to the Central Bank
2004	Implementation of Real Time Gross Settlement	To facilitate the clearing of large payments in real time.

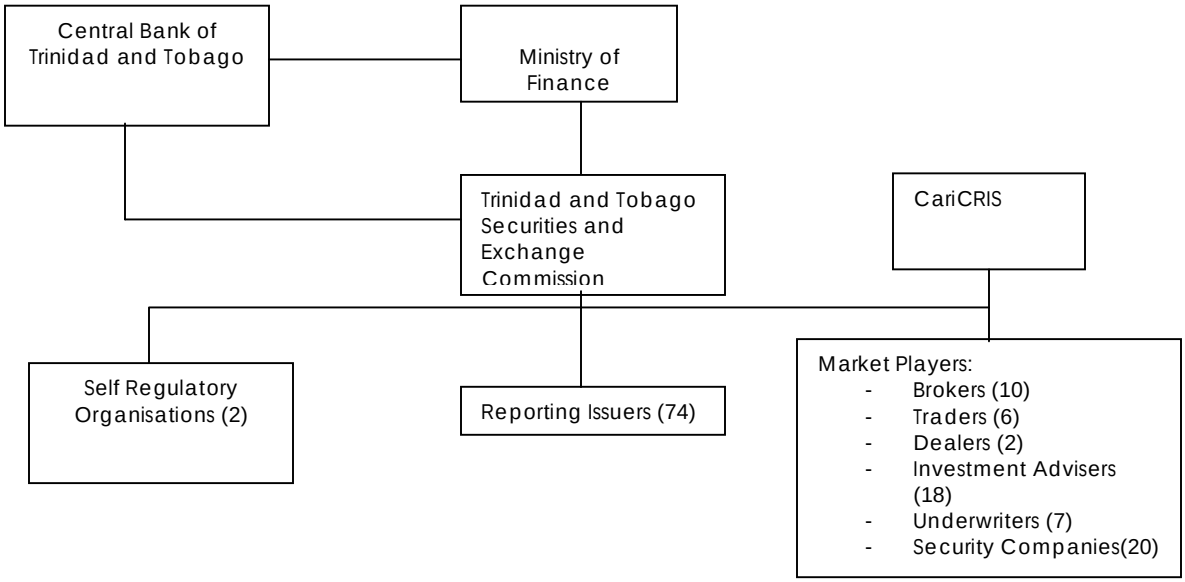
Sources: Trinidad and Tobago Securities and Exchange Commission, Development of the Securities Market in Trinidad and Tobago, 1997 to 2003, with Prospects for the future, 2004; Central Bank of Trinidad and Tobago, Annual Economic Surveys

The institutional developments in the last three years are considered pre-requisites for the creation of a liquid and transparent government bond market driven by market-based pricing, encouraging wider investor participation and contributing to benchmarking (Williams, 2004)[26].

The existing regulatory and institutional framework including regulatory agencies and key market players is depicted in Figure 3 below:

[26] Williams, E, Governor, Central Bank of Trinidad and Tobago, *Remarks at the Launch of the Auction System and the Presentation of a Prospectus for $300 million of Government Bonds, July 23, 2004*

Figure 2.0: The Institutional Framework of the Trinidad and Tobago Securities Market



Source: Trinidad and Tobago Securities and Exchange Commission, Development of the Securities Market in Trinidad and Tobago, 1997 to 2003, with Prospects for the Future

The main roles and functions of the key supervisory and regulatory institutions are listed in Table 14 below.

Table 14 Roles and functions of key supervisory and regulatory institutions in the TT securities market

Institution	Primary role/functions
Ministry of Finance	- Provides policy framework relative to securities market regulation - Provides impetus for enactment of key policies and legislations
Central Bank of Trinidad and Tobago	- Collaborates with TTSEC relative to securities market regulation issues - Oversees the Government Securities Settlement System (manages bond auctions on government's behalf ; also acts as registrar and paying agent)
Trinidad and Tobago Securities and Exchange Commission	- Ensuring market participants' compliance with the SIA (1995)
2 Self Regulatory Organisations (SROs): - Trinidad and Tobago Stock Exchange - Trinidad and Tobago Central Depository	- TTSE facilitates centralized trading of stock and supervises secondary market trading; - TTCD established by TTSE to provide a clearing facility for securities transactions and improve settlement time.

Sources: Trinidad and Tobago Securities and Exchange Commission, Development of the Securities Market in Trinidad and Tobago, 1997 – 2003, with Prospects for the future, 2004; Central Bank of Trinidad and Tobago

6.0 SURVEY FINDINGS: Price Discovery in the Trinidad and Tobago fixed-rate government bond market

Questionnaires consisting of closed and open-ended questions were administered during face-to-face interviews with senior officers of the Central Bank and Ministry of Finance as well as representatives of the Trinidad and Tobago Unit Trust Corporation (UTC) and the Caribbean Money Market Brokers (CMMB).

Central Bank and Ministry of Finance officials were interviewed to:

- Identify key regulatory changes in the bond market within the last five years,
- Outline the existing trading mechanism(s) and its/their efficacy relative to the authorities' objectives,
- Identify the main roles and responsibilities of key agencies and the relationship among agencies,
- Identify changes in bond contracts in the last five years,
- Identify the main use of funds borrowed by central government and quasi-government agencies via the bond market.

Government Securities Intermediaries (GSI) representatives were interviewed to:

- Describe the government bond market microstructure,
- Provide their perspective on the role of regulatory/supervisory agencies,
- Identify their intermediation costs,
- Compare price discovery in the underwriting system versus PD in the single-price auction system,
- Outline, as far as possible, their strategy for bid pricing,
- Describe changes in bond contracts and their impact on institutions' pricing strategies.

This discussion of the survey findings of this preliminary study is organized along the following lines:

- The Institutional Framework
- Price Discovery in the Primary Market
- Secondary Market Trading
- Role of Public and Private Information in the PD Process
- Dealer/Brokers strategies for Bid price determination

5.1 The Institutional Framework

The Central Bank and the Ministry of Finance representatives who were interviewed confirmed the authorities' recognition of the need for a well-developed government bond market that contributes to capital market development and economic growth. Respondents referred to the June 2004 document - "Reform of the Financial System of Trinidad and Tobago, A White Paper" - as central to government's strategies for the development of the capital market and other aspects of the financial sector. In the last five years, the Central Bank, Ministry of Finance and Trinidad and

Tobago Securities and Exchange Commission (TTSEC) have been involved in the formulation of new policy and procedures as well as the implementation of changes to the market architecture; they have also been responsible for the drafting of legislative amendments designed to strengthen the institutional framework of the capital market.

While the Trinidad and Tobago government securities market is embryonic compared with markets in developed countries such as the US and Canada, its development in the last forty years has outpaced changes in its architecture. As such, the TTSEC, Central Bank and the Ministry of Finance have contributed to draft amendments to both the Securities Industries Act (SIA) of 1995 and the Financial Institutions Act (FIA) of 1993 in order to provide the framework required to facilitate the development of an efficient capital market. The objectives of these amendments include the establishment of a centralized supervisory and regulatory authority with the power to enforce rules, regulations and legislation that govern the financial services sector. Legislative reform focuses on the introduction/enactment of laws that adequately protect the interest of market participants and the integrity of the financial system while ensuring conformity with international standards.

The Central Bank, Ministry of Finance and the TTSEC, according to the literature are responsible for various aspects of the management of the local capital market. Respondents referred to the TTSEC at the agency responsibility for the enforcement of capital market regulation but no respondent could identify any recent regulation that impacts the bond market. It is noteworthy that in the TTSEC's review of domestic capital market development between 1997 and 2003, many market participants shared the view that the Commission does not have sufficient power to regulate the market or enforce the regulations that exist. As such participants do no perceive the market as transparent. According to the literature this means that the price discovery process is not efficient due to the presence of asymmetric information in the trading process.

The roles of both the Central Bank and Ministry of Finance have changed with the evolution of the trading mechanism for fixed-rate government bonds in the primary market. Prior to the introduction of the auction system in 2004, the Central Bank acted as advisor to the central government and the Ministry of Finance relative to the assessment of term structures submitted by potential arrangers/underwriters involved in the underwriting process. The introduction of the single-price electronic auction system shifted the Bank's role from advisor to manager of the auction on behalf of the government; the Bank also responsible for the functions of registrar and paying agent. The Bank's specific responsibilities are outlined in an earlier section of this report titled "An Overview of the Trinidad and Tobago Government Bond Market".

The role of the Ministry of Finance also changed with the introduction of the auction system. In the underwriting system, the Ministry advised state enterprises/statutory authorities on the term structures submitted by potential arrangers/underwriters based on their (issuers') needs. The Ministry also liaised with the Central Bank and informed the latter of new bond issues given their potential impact on macroeconomic variables within the domestic economy. In the auction system, although the Central Bank acts as Manager, Registrar and Paying Agent, the Ministry still

provides guidance to statutory and state enterprises issuing fixed-rate bonds. Furthermore, the Ministry is responsible for preparation of various types of required documentation including the Guarantee for the selected arranger/underwriter for the issue. At the close of the auction, the Ministry gives the Central Bank disbursement instructions for the money raised by auctions of government-guaranteed bonds.

The government's objectives for replacing the underwriting system with the auction system is consistent with Dattels' (1995) assertion that an automated auction system increases the number of traders, makes the market deeper and more liquid while promoting more efficient price discovery. While interviewees recognised the theoretical benefits of the auction system, they also identified shortcomings in the implementation of the system. Representatives of the government, monetary authorities as well as GSIs referred to the fact that state enterprises/statutory authorities still issued bonds via the underwriting system. Both officials of the Central Bank and the Ministry of Finance cited expediency as the primary reason for using underwriting instead of the auction system. This dual system is contrary to the objectives of full transparency in the allocation of bonds and the level of efficiency in the price discovery process articulated by government and the monetary authorities.

The literature suggests centralized regulation is optimal for market efficiency. The same can be said for management of the trading system in terms of economies of scale and lower transaction costs: At present, the co-existence of two mechanisms for the allotment of bonds: underwriting and auction means that the benefits of centralization relative to management are also foregone.

5.2 Price Discovery in the Primary Market

Trading of fixed-rate government and government-guaranteed bonds in the primary market occurs on an 'ad hoc' basis as such, the market can be classified as 'periodic' given the discrete order flows. Bids are submitted for a single trading process, which, according to the literature, results in a degree of price stability compared with the price fluctuations that could occur from a continuous bidding process.

The trading mechanism is central to the PD process for fixed-rate government bonds. Prior to July 2004 the underwriting approach was used to allocate central and quasi-government bond and the PD process was akin to the 'black box' system since the Merchant banks which were invited to submit term structures were not privy to their competitors' term structures even after the issue was closed. Given this lack of transparency, the PD process was inefficient as it did not facilitate true competition among potential arrangers and underwriters. 'Bids' in the underwriting system were further impacted by the arrangement and underwriting fees that were included in the term structures submitted by competing bidders. GSIs interviewed indicated that legal costs for the preparation of relevant documentation were also included in the overall transaction costs; these costs differ depending on the type of deal.

The introduction of the single-price auction system in July 2004 was intended to improve the transparency and integrity of the bond trading process. All respondents considered the introduction of the auction system as the most significant

change in the bond market microstructure in the last five years. In contrast to the 'black box' approach, publication of the results of auctions provide bidders with information such as the total mount bid, the cut off price, the range of successful bids as well as the amount allotted to non-competitive investors. Although theoretically, the auction system allows market forces to determine a fair price and therefore results in better price discovery, at present the spread between bids is still fairly large for example, The Urban Development Company of Trinidad and Tobago (UDeCott) bond issued on January 18 2006 for TTD192 MM attracted bids (per $100 face value) which ranged from $85.83 to par $100.00. Interviewees cited asymmetric information and variations in the skill level of personnel at bidders' institutions as possible reasons for these spreads; this will be explored later in the sub-section titled "Role of Public and Private Information in the PD Process".

The role of the 'auctioneer' is also central to the PD process in the government and government-guaranteed bond market. In the domestic market, the Central Bank takes on the role of auctioneer and has the right to set a minimum acceptable bid price for auctions. The Bank ranks competitive bids from the highest price to the lowest and determines the cut-off price that is the price needed to fully allocate the bond issue. The Bank can reject bids based on the minimum price and has the authority to re-issue unsubscribed balances or even cancel an auction if, for example, subscription is too low. In this scenario, the PD process is not fully based on market forces and the 'market clearing price' is not determined purely by market forces as in the case of a 'passive auctioneer'.

The auction system was intended to widen the base of participants by encouraging bids from the general public but this has not been realized. GSIs indicated that between 2% and 10% of the total bids they've submitted since July 2004 were non-competitive. The two reasons for this, as indicated by the GSIs are a lack of public education programmes which makes investment in the bond market an attractive option as well as the absence of incentives for the four GSIs that have been licensed to submit non-competitive bids to promote/encourage non-competitive bidders. It should be noted that there is no PD process for non-competitive bids since these bidders receive pro-rated allotments at the cut-off price.

Although the auction system was expected to replace the underwriting system, a dual-system is in effect.
The dual approach allows government agencies and enterprises to issue bonds via the underwriting mechanism. Both Central Bank and the Ministry of Finance officials referred to a UdeCott bond which was issued earlier in 2006 via the underwriting system. The mixed approach obviously compromises the transparency objective as well as the efficiency of the PD process. Furthermore, by-passing the auction system, issues are not open to the range of potential investors that exist in the system.

It should be noted that while some interviewees indicated that given the small number of institutional bidders the auction system can be manipulated through 'collusion' by GSIs which might want to send a price 'signal' to the issuer. Interestingly, one interviewee refuted this by arguing that ultimately, GSIs are in competition with each other and are therefore unlikely to collude.

5.3 Secondary Market Trading

Since 1997 there has been modest activity in the secondary market for government bonds and credit/debit derivatives both in terms of the number of transactions as well as the face value of transactions; an average of 12 annual transactions at an average annual value of TTD13.22 MM were recorded by the TTSEC. The value of secondary market activity averages at less than 3% of the value of primary bond issues each year. One reason for low activity is the fact that investors such as pension plans have long-term investment horizons. One GSI indicated that bonds were purchased to satisfy long-term investment objectives.

Securities in the secondary market are traded via the over-the-counter (OTC) mechanism which is less transparent and less efficient relative to the price discovery process. Also impacting the PD process is the absence of a benchmark yield curve as a result of the fragmentation in the primary market. It should be noted, however, that some financial institutions have derived their own yield curves using interpolation methods.

Another factor that affects price discovery in the secondary market is the high concentration of issuers – three financial institutions are responsible for over 95% of the instruments traded. This is compounded by the absence of legislation which requires issuers to make disclosures and to register derivatives and similar products traded on the secondary market with the TTSEC.

5.4 Role of Public and Private Information in the PD Process

While the Central Statistical Office gathers, analyses, compiles and publishes economic data, announcements on macroeconomic performances which have a direct impact on the financial services sector have primarily been issued by the Central Bank via media releases and media briefings. For this reason, the public announcements considered in this study as factors which can impact bid prices were those issued by the Central Bank between 2002 (when 'repo' rate announcements began) and 2005. In Inoue's (1999) study, public information was found to affect intraday and intraweek trading prices for government securities however, the discrete trading which occurs in the domestic primary bond market makes it difficult to draw similar conclusions about the relationship between similar public announcements and bid prices or even term structures.

The relationship between public announcements and TT fixed-rate government bond prices can be loosely traced as follows: "Repo rate" changes have a positive and direct impact on commercial banks' prime lending rates which have a ripple effect on other rates within the financial system. These rates also impact investors' expectations of long-term interest rates which in turn influence term structures and bid prices in the underwriting and auction systems respectively.

While GSIs have identified movement in the inflation rate as a separate factor that influence their bids, public announcements by the Central Bank in the last two years have linked to changes in the 'repo' rate to the Bank's attempt to control inflation and reduce the spread between US and TT short-term instruments.

Contrary to the expectation that the auction system would have reduced bid spreads this has not occurred. One respondent attributed this to private information and variations in 'institutional expertise' which can be classified as asymmetric information. This is consistent with the hypothesis that private information impact government securities' prices although to a lesser extent than public symmetric information.

5.5 Dealers/Brokers strategies for Bid price determination

GSIs interviewed were asked to rank[27] factors which influence their bid prices for fixed-rate government and government-guaranteed bonds. They were also asked to rank the influence of the same factors relative to bids for **non-TT** sovereign bonds. A discussion of the impact of these factors follows below:

Changes in bond contracts

Officials of the Ministry of Finance, the Central Bank and GSIs indicated that in the last few years, the most significant change relative to bond features was the removal of call options on government and government-guaranteed bonds. This means that for government to buy back its bonds it has to enter the market. The Ministry of Finance official noted that government has been calling high cost bonds since 1999 given its (government's) strong fiscal position and the relatively low interest rate environment that existed up to mid 2005. One GSI indicated that the removal of the call feature impacted bid prices since bonds without the call option did not carry the premium that bonds with the option attracted.

Government guarantees for bonds issued by quasi-government agencies was described by a GSI as another 'feature' which impacts a bond prices; if, for example, investors knew that government had established a sinking fund for a government-guaranteed bond then they will pay a higher price for the bonds. This suggests that the guarantee was equivalent to a reduction in the risk attached to the bond and therefore attracted higher bids.

While not directly impacting PD, another significant change in bond contracts is the fact that contracts are now de-materialized (issued in electronic format) which makes settlement more efficient.

Changes in the 'repo' rate

As mentioned in the subsection above titled "*Role of Public and Private Information in the PD Process"* changes in the Central Bank's repurchase or 'repo' rate, influence bid prices submitted by GSIs for government bonds. GSIs rated changes in the 'repo' rate as very influential (3 and 4 out of a maximum of 5) in their price formation process. As depicted in Tables 11.1 and 11.2, increases in the 'repo' rate are followed by increases in the yield on 10-year and 15-year fixed-rate government and government-guaranteed bonds. It is difficult to measure the extent and immediacy of the impact of 'repo' rate announcements on coupons and bid prices, given the scope of this study and the thinness of this market.

[27] Respondents were asked to rank the factors on a scale of 1 to 5 where 1 indicated 'no influence' and 5 indicated 'a high degree of influence'

Movements in Treasury Bill rates and expectations of long-term interest rates

One of the objectives of this study is to identify an interest rate model that explains local investors' behaviour relative to bid prices for new issues of fixed-rate government/government-guaranteed bonds. The basic interest rate anticipation strategy was the first approach considered as an explanation for GSI's inclusion of bonds in their portfolio. According to this strategy, investors move between long-term bonds (especially zero-coupon bonds) and very short-term treasury bills based on their forecasts of rates over specific time periods. Term structure of interest rate theories were also considered as possible explanation for the investment behaviour of GSIs. The term structure theories that were considered were the Unbiased Expectations Theory which argues that bonds of different maturities are considered perfect substitutes since current long term interest rates are determined by the market's expectations of future short-term interest rates. The Market Segmentation Theory and the Liquidity Premium Theory were also examined for their applicability to local investors. According to the former, investors have specific maturity needs therefore, bids for bonds are not based on short-term rates and assets are not perfect substitutes. The latter theory, which is considered a combination of the Expectations Theory and the Segmented Markets Theory assumes that risks and coupons increase the longer the term to maturity.

Short and long term interest rates were compiled in Table 15 as a first step in identifying interest rates trends relative to government securities' bid prices. Table 14 contains annual yields in the Trinidad and Tobago government securities market: at the short end of the spectrum it begins with 90-day T-bill rates and extending to yields on 25 year fixed-rate government/government-guaranteed bonds, where applicable.

Table 15: Yields across maturities

Year	90-day T-Bill ave. rate (%)	10 year bond ave. coupon rate %	15 year bond ave. coupon rate %	20 year bond ave. coupon rate %	25 year bond ave. coupon rate %
1995	8.2	n.a	11.55	11.3	12.2
1996	n.a	n.a	n.a	n.a	n.a
1997	9.74	9.95	n.a	11.5	n.a
1998	11.99	n.a	n.a	11.54	n.a
1999	10.33	11.38	11.16	11.5	14.75
2000	10.28	11.43	11.78	11.96	n.a
2001	9.59	11.0	11.65	11.54	n.a
2002	4.75	7.5	7.75	10.25	11.85
2003	4.83	6.35	6.28	n.a	n.a
2004	4.76	n.a	6.03	n.a	n.a
2005	4.68	6.0	6.35	7.0	7.75

Bond rates are for government and government/guaranteed bonds issued between 1995 and 2005

Sources CMMB, Bond Guide, July 2006; Central Bank of Trinidad and Tobago

According to the data in Table 15, yields on government securities increase as maturities increase. It also shows that over time the trends exhibited by yields on short-term instruments is mirrored by yields on long-term securities; in general between 2001 and 2005, the trend of declining rates on 90-day T-Bills was similar to the trend of declining coupons on 10-year, 15-year, 20-year and 25-year bonds. The data in Table 15 also suggest that investors require

higher returns as risk and maturity increases; this is in conformity with the Liquidity Premium theory which states that investors will hold long term maturities only if they are offered a premium to compensate for future uncertainty which increases with an assets maturity. This theory also implies an upward-sloping yield curve which can be derived from the data in Table 15 using interpolation methods. GSIs interviewed ranked movements in domestic T-bill rates in terms of their influence on bid prices between 2 and 3. Expectations of long-term rates were ranked higher at 3 and 4. The conclusion that the Liquidity Premium is the most applicable theory is very preliminary and it is apparent that more rigorous analysis would be required to confirm the applicability of the Liquidity Premium Theory and to conclusively reject the other theories that were considered to explain local bond holders' investment strategies.

Changes in the rate of inflation

Movements in inflation rates were rated at 4 with respect to its influence on bid price formulation. In a previous section it was noted that changes in the 'repo' rate in Trinidad and Tobago particularly in 2005 are directly influenced by changes in inflation rates. This relationship is outlined in the Central Bank media releases and repo rate announcements. For bond holders changes in the rate of inflation as well as expectations of long term inflation rate is significant given the fact that higher inflation rates in the domestic scenario seem to lead to higher 'repo' rates lead to higher domestic interest rates and thus a fall in bond prices. Furthermore, with long horizons, the inflation rate is critical to determining real interest rates and hence the real cost of borrowing. Within the scope of this study, the inflation rate is tied to the impact of public announcements of macroeconomic performance and is discussed in the section above which deals with the impact of public and private information on bond price formulation.

Transaction costs

For the purpose of this study, transactions costs included brokerage fees, legal fees and settlement costs. Transaction costs were the lowest rated factor (1 and 2) considered by GSIs when formulating bid prices for government and government-guaranteed bonds. As noted by respondents, in the underwriting process, arrangement and settlement fees are included in the term structure submitted to issuers' consideration but with the auction system there are no transaction costs that are factored into bids. One GSI noted that administration costs for non-competitive bids which comprised between 2 and 10 percent of bids were absorbed by the GSI submitting the bid and were therefore not included in the transaction costs. The low transaction costs associated with the auction system implies, theoretically, that bids submitted via the auction system should be lower (and the PD process more efficient) than term structures submitted using the underwriting approach.

The speed with which bonds can be converted into cash

While one GSI indicated that this was not a factor considered when formulating bid prices, another ranked it at 2 in terms of its degree of influence. This factor basically looks at liquidity in the market however its low rating can be attributed to the fact that the majority of bonds are bought and held by dealers or used as the underlying instruments for secondary market derivatives. This suggests that many if not most investors holding bonds to satisfy their long-term investment needs and as such, the speed with which they can be converted is not a significant factor.

Investment opportunities abroad

GSIs interviewed rated investment opportunities abroad at 5 out of 5 (the highest possible rating) relative to bid price determination. This assumes that returns on investment abroad are compared with returns on similar investment instruments in the context of investors' needs. GSIs identified non-TT sovereigns for Latin America and Caribbean countries and the US as a part of their portfolios. One indicated that it held sovereign bonds in extra-regional emerging markets e.g. Turkey in addition to those in Latin America, other Caribbean islands and the US.

Government bonds issued by the following countries were identified by GSIs as included in their portfolios: Barbados, St. Lucis, St. Vincent, Jamaica, Russia, Turkey and the United States. When asked to rank the level of influence of various factors when formulating bid prices/term structures for non-TT regional or extra-regional government bonds. GSIs' responses diverged. One ranked all of the following factors at 4 out of a possible high of 5: Policy rates, long term interest rate expectations, movements in LIBOR and US T-Bill rates, changes in the rate of inflation, transaction costs, expectations of the economy's long-term performance, liquidity and other investment opportunities outside of Trinidad and Tobago were the other factors that were identified by one GSI as influential. The other GSI indicated that the expected long-term performance of the economy, other investment opportunities abroad and the institutions liquidity were the most significant factors – rated 5 out of 5; these were followed by the country's policy rate, and movements in the inflation rate each ranked 4 out of 5. Expectations of long term interest rates were rated 3 while interestingly the lowest ranked factors were movements in short-term rates including LIBOR and the US T-Bill rate as well as transaction costs each ranked 2 out of 5. One GSI indicated that macroeconomic fundamentals exert a greater influence on bond prices in developed economies than in less developed countries.

7.0 CONCLUSION

It is indisputable that development of an efficient bond market is crucial to economic growth of Trinidad and Tobago as well as the region. The monetary authorities are aware of the shortcomings of the infrastructure (particularly regulatory and supervisory components) which inhibit efficient price discovery in both the primary and secondary market for government bonds. In addition, the White Paper of 2004 which has outlined the gaps between the current financial system and government's vision for the financial services sector, is the foundation document for development of its strategies for closing the gaps.

Nevertheless additional research into the PD process in the local government securities market at present, and as it evolve, would be instructive to market design – in particular trading mechanisms - which must keep pace with market development.

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