Competitive Headwinds Blow Toward the Windy City

By: Team MOAB
Gwyn Jones, Steve Neebe, Justin Owen, and Sam Snyder

Introduction:

For this study, we applied our game theory tools to evaluate the likely strategic moves by key players driving consolidation in the financial exchange sector. Recently, the Deutsche Borse, a major European exchange, signed a merger agreement with the flagship US exchange, the NYSE Euronext, with the goal that the combined entity will expand local market share, improve firm-wide profitability, and broaden their respective suites of products and services. This growth has to come at the expense of other competitors, one of which is likely the Chicago Mercantile Exchange. In particular, DB/NYSE would pose a threat to CME's monopoly in the US interest rate futures market. As a result, we believe that the CME is weighing a counterbid on the sideline and therefore present a mental model coupled with a strategic analysis to determine whether pursuing a counterbid is the right move for the CME.

Our assessment covers all of the elements of the strategic situation. We analyze (i) the players and their motivations, (ii) the actions available to each, (iii) the timing of the moves, (iv) information pertinent to the decision-making process, and (v) the payoffs to each player in each possible outcome. To settle on a recommendation, we then ranked the payoffs and look forward and reason back to find the equilibrium outcome. We also stress test our mental model to determine the key variable(s) that drives the player's decision-making process. Lastly, we wrap up with a few main takeaways and an area for further study.

Players:

This market share game involves a target asset, the NYSE Euronext (NYSE), and two decision-makers, the current acquirer Deutsche Borse (DB) and the potential spoiler the Chicago Mercantile Exchange (CME). All three of these exchanges compete in some form through making markets in equities, derivatives, options, bonds and other exchangeable financials instruments.

The sought-after asset NYSE Euronext represents the combination of the New York Stock Exchange and Euronext, a merger consummated in early 2007. In the US, the NYSE has long maintained leading market share in cash equities trading (28% as of 2010YE), but changing industry dynamics, including the proliferation of high-speed trading and new entrants (e.g., dark pools), make this business a shrinking cash cow (NYSE controlled 50% market share prior to 2006).[1] To counter this decline, NYSE joined with Euronext to build a presence in higher-margin and faster growing derivatives trading, resulting in a leading position in the US equity options (23% as of 2010YE) and European derivatives (~3 million contracts traded daily in the 4Q10) sectors.[2] In 2010, options trading accounted for 33% of the firm's total revenue and, according to Wall Street Analysts, this segment should provide the majority of future growth. Despite this substantial move into derivatives, NYSE lacks a meaningful presence in the most heavily traded instrument: US interest rate futures. This market encompasses over $30 trillion in notional value and is essentially monopolized by CME (>98% market share). A major reason why NYSE has yet to make inroads in this market involves NYSE's lack of a clearinghouse function for settling and clearing trades.[3]

Key player Deutsche Borse is the largest European clearing house for Euro Interest Rate Futures. DB, along with NYSE (through its NYSE Liffe Exchange), dominates the euro futures market; however, DB also controls the clearing house for the market, a key and highly profitable link in the industry value chain. These two competitors have gone head-to-head in several major consolidation mergers over the

[1] *NYSE Euronext 4Q10 Earnings Report*. Credit Suisse. Feb. 8, 2011.
[2] *US Brokers, Asset Managers, and Exchanges*. Barclays Capital. Mar. 8, 2011.
[3] *Quick View: Powerhouses for Whose Benefit?* Financial Times. February 10, 2011.

past decade, but have been mostly unsuccessful pushing through transformational transactions. For example, both DB and NYSE bid for the London Stock Exchange and left empty-handed. In a successful DB/NYSE merger, the new entity would combine DB's clearing house infrastructure and expertise with NYSE's US platform and strong brand to challenge CME's monopoly in the lucrative US interest rates futures market.[4]

The Chicago Mercantile Exchange owns both the CME and the Chicago Board of Exchange and possesses a vertically-integrated exchange similar to that of DB's European operations with both a trading platform and a clearinghouse. The CME's monopoly in the U.S. interest rate futures market covers average daily trading volume of approximately 6 million contracts, each of which generates $0.50 in fee revenue. Gross margins for this division runs at 68%, translating into a $2 million dollar-per-day cash flow stream to the CME.[5] Upstarts have so far failed to erect beachheads in this market, with the next largest generating average daily trading volume of only 100,000 contracts.

Actions:

Player actions can be characterized as a reactive strategy. In effect, should CME react to the NYSE/DB tie-up by launching a competitive bid or accommodating the proposed merger? Several factors need consideration to evaluate the fight/accommodate tipping points.

For CME to fight, the firm must do so via a counterbid to win the NYSE, which would sustain CME's interest rate futures monopoly by eliminating the potential DB/NYSE competitive threat. Moreover, this strategy could deter future rivals as the combined synergies would improve CME's per contract margins and pricing power. CME's counterbid, however, must be significantly greater than DB's existing agreement to prevent incremental bidding by DB exercising matching rights, especially given that escalating due diligence costs incurred by CME flow through to shareholders (DB's matching rights option is covered in detail in later sections of our paper). CME must also consider additional costs, such as breakup fees paid directly to DB in the event of a successful bid by CME. Finally, CME should evaluate the financial consequences that an accommodate move would have on interest rate futures monopoly rents, including the amount of trading volume market share lost and the potential for price wars and subsequent new entrants. Overall, CME's fight/accommodate decision hinges on whether the "costs" of a counterbid and the subsequent acquisition are less than the "cost" of losing market share and monopoly rents to DB/NYSE.

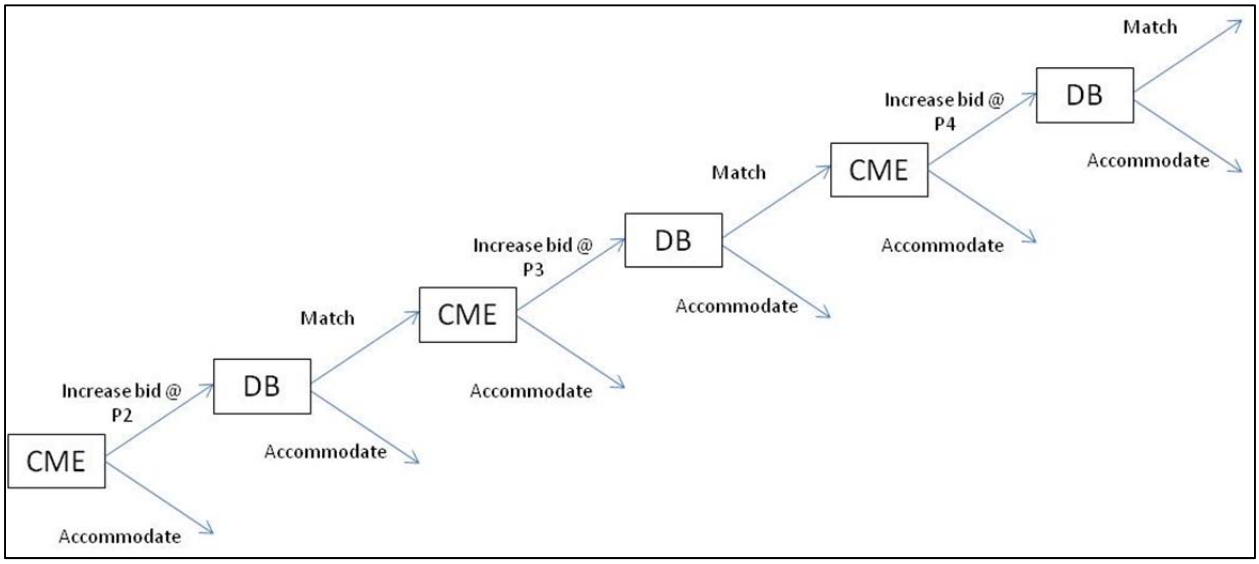
Timing:

With Deutsche Borse already committed to encroach on the Chicago Mercantile Exchange's interest rate futures market through a signed merger agreement with the NYSE, this competition for long-run market share has become a sequential game with two decision makers (see **Figure 1** on the next page). The first move represents the incumbent's (CME's) decision to either fight the competitive threat by launching a higher bid for the NYSE or accommodate the new entrant's (DB/NYSE's) seizure of market share. The new entrant (DB) then chooses to either fight the counterbid by exercising matching rights or accommodate the counterbid by instead pocketing the breakup fee. Following this new entrant decision node, all subsequent, sequential moves repeat the same scenario, but at progressively higher acquisition premiums.

[4] *A Market to Capture.* Financial Times. February 17, 2011; *Quick View: D Borse-NYSE Deal Complicates US Market*. Financial Times. February 10, 2011.

[5] Company filings, including the 2010 10-K.

Figure 1: Sequential Game Tree



Information:

The initial DB/NYSE merger was announced on February 15th, 2010, but the plans were first "leaked" to the public on February 9th. DB plans to use newly-issued stock to fund the transaction, with pro forma ownership of the combined entity split 60%/40% between DB and NYSE. The two key aspects of the merger agreement that influence the players' decision-making process are (i) the 3% breakup fee (~ $340 million) paid to DB if NYSE were to renege on the existing merger agreement to instead join up with a competing bidder and (ii) the matching rights option held by DB that DB can exercise to match any competing bid.[6] These two factors in the context of a bidding scenario parallel the game-changing elements of the NBA free agency game discussed in class, namely the cost a rival incurred to submit a bid as well as the incumbent owner's possession of a right-of-first-refusal.

Payoffs:

Our key payoff assumptions aim to determine whether CME should pursue a potentially costly bidding war to protect monopoly rents in the US interest rate futures market. Our analysis required assumptions on (i) the net present values of the "as is" interest rate futures market (V1); (ii) the after-tax synergies that accrue to the buyer of the NYSE (SC and SD); (iii) the interest rate futures market share split in a successful DB/NYSE merger (M); and (iv)the ensuing decline in industry-wide profitability, an effect captured by a duopoly price war discount factor (embedded in V2 in **Figure 2** on the next page). As a result, any scenario in which CME successfully bids for the NYSE uses payoff calculations based on CME maintaining 100% market share at current price levels. On the other hand, any scenario in which Deutsche Borse successfully acquires the NYSE incorporates payoff calculations based on divided market share and a reduced level of interest rate futures trading profitability.

We also incorporated four different acquisition premium scenarios into our payoff analysis, consisting of (i) the premium (**P1**) implied by Deutsche Borse's initial 2/9/2011 bid; (ii) the premium (**P2**) paid by DB that would result in a payoff to DB equal to that of the breakup fee (i.e., DB is indifferent at the P2 level between exercising matching rights or pocketing the breakup fee); (iii) the premium (**P3**) paid by CME that would result in a payoff to CME equal to that earned by CME through accommodating the initial Deutsche Borse bid; and (iv) the premium (**P4**) paid by CME that results in a net zero payoff to

[6] *D Borse and NYSE Set a $340 million Breakup Fee*. Financial Times. February 17, 2011.

CME. These premium scenarios allowed us to not only assess whether CME should pursue a counterbid, but also identify the optimal price that CME should bid to maximize its net payoff while preventing Deutsche Borse from exercising matching rights. Please see **Figure 2** below for a summary of our key payoff variables as well as **Figure 3** for the CME and DB payoffs that occur at each node. In addition, see the **APPENDIX** for a detailed description of the methodology behind each payoff variables assumption.

Figure 2:

Payoff Variables Key	
PV of Interest Rate Futures Monopoly Rents **(V1)**	$5.2
PV of Interest Rate Futures Duopoly Rents **(V2)**	$4.2
Breakup Fee Paid to Deutsche Borse by Acquiror **(B)**	$0.3
Interest Rate Futures Market Share Gain by DB/NYSE **(M)**	50%
Due Diligence Costs **(D)**	0.50%
PV of DB/NYSE Synergies @ 15% Discount Rate **(SD)**	$1.7
PV of CME/NYSE Synergies @ 15% Discount Rate **(SC)**	$1.7
Implied Initial Control Premium by DB **(P1)**	10%
Maximum Premium by DB to breakeven w/Breakup Fee **(P2)**	41%
Maximum Premium by CME that Equals Lost Monopoly Rents @ M **(P3)**	52%
Maximum Premium by CME to breakeven **(P4)**	76%

Additional Assumptions	
NYSE Pre-Merger Enterprise Value	$8.6
Initial Deutche Borse Bid (2/9/2011)	$9.5
Announced annual DB/NYSE Synergies	$0.6
Forecasted CME/NYSE Synergies	$0.6
Duopoly Price War Discount Factor	20%

Figure 3: Payoff Calculations

Game Tree Payoff Nodes	CME Payoffs		DB Payoffs	
No Initial CME Bid; DB/NYSE Merger	= V2*(1-M)	$2.1	= V2*M + SD – P1	$3.0
CME Counterbid @ P2; No DB Counterbid	= V1 + SC – P2 – B - D	$3.1	= B	$0.3
DB Matches @ P2; No CME Counterbid	= V2*(1-M) - D	$2.0	= V2*M + SD – P2 - Inc. D	$0.3
CME Counterbid @ P3; No DB Counterbid	= V1 + SC – P3 – B - D	$2.1	= B - Inc. D	$0.3
DB Matches @ P3; No CME Counterbid	= V2*(1-M) - D	$2.0	= V2*M + SD – P3 - Inc. D	($0.7)
CME Counterbid @ P4; No DB Counterbid	= V1 + SC – P4 – B - D	$0.0	= B - Inc. D	$0.3
DB Matches @ P4; No CME Counterbid	= V2*(1-M) - D	$2.0	= V2*M + SD – P3 - Inc. D	($2.7)

Payoff Ranking:

As a preliminary step in our strategic analysis, we ranked the outcomes for both players in descending order from the highest payoff to the lowest (see **Figure 4** on the next page). Interestingly, the most striking observation from the rankings is that the outcome involving a CME counterbid at the P2 premium level with accommodation by DB shares the highest paired ranking (#1 for CME and #2 for DB; highlighted in orange in the table below) with the outcome in which CME accommodates the initial DB bid (#1 for DB and #2 for CME; highlighted in blue in the table below).This observation implies that any fight/accommodate inflection point likely occurs in the first two moves of our game tree, specifically the initial decision by CME whether or not to engage in a higher bid, and the subsequent decision by DB whether or not to exercise its matching rights.

Figure 4: Outcome Rankings by Payoffs (Descending)

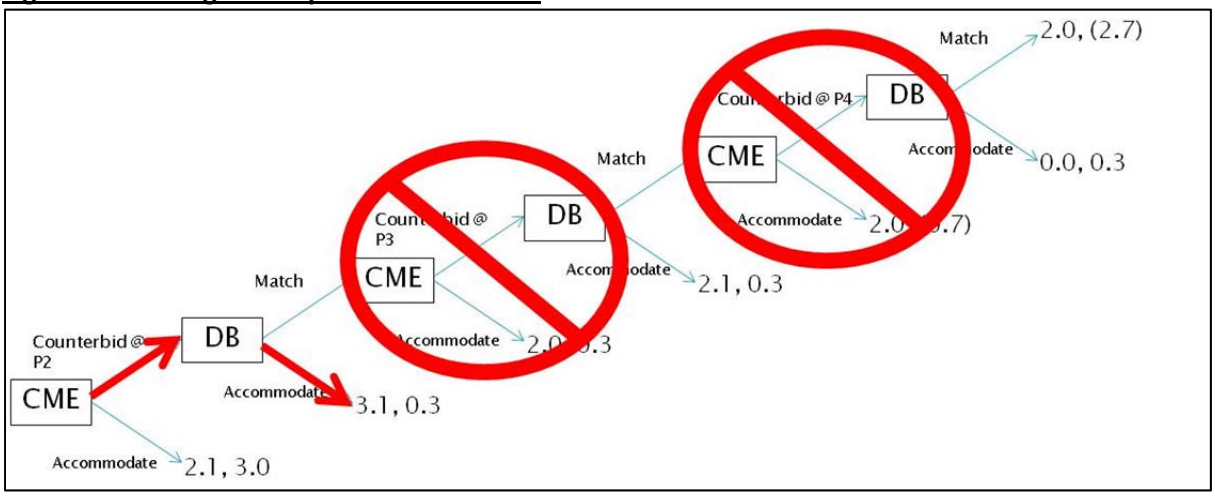
CME Ranked Payoffs	DB Ranked Payoffs
CME Counterbid @ P2; No DB Counterbid	**No Initial CME Bid; DB/NYSE Merger**
No Initial CME Bid; DB/NYSE Merger	**CME Counterbid @ P2; No DB Counterbid**
CME Counterbid @ P3; No DB Counterbid	DB Matches @ P2; No CME Counterbid
DB Matches @ P2; No CME Counterbid	CME Counterbid @ P4; No DB Counterbid
DB Matches @ P3; No CME Counterbid	CME Counterbid @ P3; No DB Counterbid
DB Matches @ P4; No CME Counterbid	DB Matches @ P3; No CME Counterbid
CME Counterbid @ P4; No DB Counterbid	DB Matches @ P4; No CME Counterbid

LFRB'ing the Sequential Game Tree

To determine the optimal move for CME, we first applied an "outward" focus on the decision pattern for DB. Using the $340 million breakup fee as the net payoff threshold to DB that, when breached by a given premium (**P2** in our analysis), would lead DB not to exercise matching rights to acquire the NYSE, we calculated that DB would back away from the merger at any premium at or above 41% (**P2)** of the NYSE's pre-merger announcement enterprise value. Explicitly, this purchase price ceiling means that DB would accommodate a counterbid by CME at all premium levels greater than **P2** Moreover, CME, knowing this limit, would benefit the most from bidding just above this threshold since all of the variable costs in CME's net payoff calculation grow as the acquisition price increases. As a result, we "crossed out" the **P4** and **P3** branches of the decision tree (see **Figure 5** below).

Of course CME's motivation to submit a competing bid under any conditions depends on whether the payoff stemming from a CME/NYSE merger is greater than that from the scenario in which CME accommodates a DB/NYSE merger (and subsequently loses monopoly rents). This inequality is based on whether a positive spread exists between **P3** and **P2**. In other words, CME's initial fight/accommodate decision depends on whether the payoff to CME in the scenario where the firm pays a premium that results in a payoff equal to that earned by CME through accommodating the initial Deutsche Borse bid is greater than the payoff to CME in the scenario where the firm pays a premium that results in a payoff to DB equal to DB's breakup fee. Under our assumptions, **P3** >**P2** (52% > 41%), so CME would realize a net payoff in this premium range greater than that earned if CME were to accommodate DB's initial bid. This conclusion yields an equilibrium result of DB accommodating a CME counterbid at the **P2** (or slightly above) premium level (see **Figure 5** below).

Figure 5: LFBR'ing the Sequential Game Tree



Which variable(s) drives CME's initial decision?

As shown previously, CME's decision whether to fight or accommodate the proposed DB/NYSE merger depends on the spread between **P3** and **P2**. Namely, if this spread is positive, CME fights; if the spread is negative, then CME achieves a greater payoff by accommodating. To hone in on the variables that drive this relationship, we sensitized the **P3 – P2** spread with respect to the market share lost and duopoly price war discount factor variables (see **Figure 6** below).

Figure 6:

Net Spread Between P3 and P2 at Different Market Share Lost and Duopoly Price War Discount Factor Assumptions						
		Market Share Lost				
		10%	20%	30%	40%	50%
Duopoly Price War Discount Factor	0%	-1%	-1%	-1%	-1%	-1%
	10%	6%	6%	6%	6%	6%
	20%	12%	12%	12%	12%	12%
	30%	18%	18%	18%	18%	18%
	40%	24%	24%	24%	24%	24%

As expected, the spread increased as the duopoly price war discount factor grew—consistent with notion that the CME is more incentivized to prevent a DB/NYSE merger the larger the decrease in CME's monopoly rents (per contract) that results from more competition. The market share lost percentage, however, appeared to have no effect on the spread, which would imply that this assumption does not drive CME's decision-making process.

To explore this observation further, we took a close look at the arithmetic of our spread calculation (see **Figure 7** below).

Figure 7: P3 and P2 calculations:

The Maximum Premium paid by CME that Equals Lost Monopoly Rents @ M **(P3)**	=	$(V1 + SC - B - D_{P3} - V2*(1-M)) / NYSE Pre-Merger EV$
The Maximum Premium paid by DB to Breakeven w/Breakup Fee **(P2)**	=	$(V2*M + SD - D_{inc} - B) / NYSE Pre-Merger EV$

Setting up the inequality **P3 > P2**, the breakup fee (B), synergy PV (SC and SD; we assumed these were equal at the outset), and NYSE Pre-Merger EV terms cancel out. In addition, the market share lost term (M) ends up paired with the PV of interest rate futures duopoly rents (V2) on both sides as V2*M, which also cancels out. This cancellation explains why stressing the market share lost variable has no effect on the **P3 – P2** spread. Lastly, the inequality boils down to: $V1 - V2 - D_{P3} + D_{inc} > 0$. Because due diligence costs are relatively small (only 0.5% of the transaction price for CME (D_{P3}) and a much smaller increment to DB (D_{inc}) because DB's due diligence costs incurred at the already announced P1 are sunk), this leaves the duopoly price war discount factor imbedded in V2 as CME's primary fight/accommodate decision driver.

Conclusions/Takeways:

This project left us with three general takeaways. First, outward thinking in strategic M&A situations is critical. Indeed, the justification for pursuing a strategic acquisition depends not only on an intrinsic analysis of the target's fair value and synergy potential, but also on the assessment of how different tie-ups between competitors (or potential competitors) will affect industry-wide profits. Second, because strategic mergers have so many moving parts, the game theorist's mental model should try to minimize noise by isolating one or two key variables. In our analysis, we isolated the

unknown duopoly price discount factor variable as the main driver in our game tree equilibrium conclusion. Third, the lack of insider knowledge and operating data limited the scope of our analysis and led to some quick and dirty assumptions. In particular, we did not have access to CME's evaluation of the competitive dynamics in the interest rate futures market in a combined DB/NYSE world or to granular financial data on the segment's profit margin levels and trends.

Despite this information hurdle, we are confident that our analysis mirrors some of the strategic dialogue presently occurring in the boardroom at the CME. To date, the well-known cash equities and derivatives exchange operator NASDAQ has been the only company openly pursuing a competing bid for the NYSE. News articles report that the CME, among other exchanges (e.g., the Intercontinental Exchange), are potential acquisition partners for the cash-strapped NASDAQ; yet, a strategic marriage has yet to materialize. Accordingly, as long as CME remains quiet on the sidelines, we believe that CME's management team and directors see the "costs" from increased competition in the interest rate futures market as less than those incurred in a bidding war. That is, **P3 < P2.**

Area for Future Analysis:

On a deeper level, because the initial DB/NYSE proposal is an all-stock transaction, the matching rights option creates an additional layer of complexity in the bidding process. With stock as the only consideration in the initial bid, a competing offer has to provide a value above that of the combined entity (DB plus NYSE's enterprise values in this case) rather than just that of the standalone NYSE. Furthermore, the small premium going to NYSE shareholders implied by this all-stock transaction makes the deal seem almost like a merger-of-equals. If a competing bid were to materialize, an interesting battle may ensue as both the topping bidder and DB would need to debate both the pro forma combined enterprise value of the combined entity as well as the residual value that should accrue to NYSE shareholders through the exchange ratio.

Needless to say, DB, mindful of this dilemma as well as the pain and uncertainty that come with a competitive auction process, did some looking forward and reasoning back of its own. Indeed, DB realized a competing bidder would likely need one or more bulge bracket investment banks to help the firm navigate the negotiation process and attain financing. To squeeze out these potential rivals, DB has hired a very large group of top tier banks (9 in total) to advise on the transaction, 2x to 3x the usual number.[7] Now, from a fiduciary stand point, these banks are barred from assisting a rival bidder. As a result, the CME or any other prospective buyer will not only have to tackle a complicated valuation exercise and auction environment, but also handle the process with a depleted lineup of advisors.

[7] *D Borse and NYSE Expand List of Advisors.* Financial Times. February 16, 2011.

APPENDIX: Payoff Variables Key & Additional Assumptions Explanations:

PV of Interest Rate Futures Monopoly Rents (V1): Calculated by multiplying CME's enterprise value ($20.8 billion as of 3/18/2011) by the 3-year average percentage of total CME sales made up by Interest Rate Futures-related revenues (25% of '08-'10 total revenues).

PV of Interest Rate Futures Duopoly Rents (V2): Calculated by multiplying the PV of Interest Rate Futures Monopoly Rents (V1) by the Duopoly price war discount factor.

Breakup Fee Paid to Deutsche Borse by Acquiror (B): Reported as $340 million paid to Deutche Borse in the event the planned tie-up with NYSE is not consummated.

Interest Rate Futures Market Share Gain by DB/NYSE (M): The assumed market share gains by a combined DB/NYSE in the Interest Rate Futures market at the expense of CME.

Due Diligence Costs (D): Assumed to be 0.5% of the final acquisition cost.

PV of DB/NYSE Synergies @ 15% Discount Rate (SD): Based on the after-tax annual synergy amount and realization schedule reported by Deutsche Borse in the press. See the table below for exact calculations:

DB/NYSE Synergy Schedule ($bn)					
Discount Rate	15%				
		Realization Rate			**Terminal**
		13%	**38%**	**75%**	**Value**
Realized Synergy		$0.1	$0.2	$0.4	$3.7
@ 40% Tax Rate		$0.0	$0.1	$0.2	$2.2
PV Factor		0.87	0.76	0.66	0.66
Post-Merger Year		1	2	3	4
PV of After-Tax Syn.		$0.0	$0.1	$0.2	$1.4
Total PV	**$1.7**				

PV of CME/NYSE Synergies @ 15% Discount Rate (SC): Assumed to be the same as that attainable by DB/NYSE.

Implied Initial Control Premium by DB (P1): The purchase price amount (as a percentage of NYSE's pre-merger announcement enterprise value) in excess of NYSE's pre-merger announcement enterprise value (based on the 2/8/2011 closing stock price).

Maximum Premium by DB to breakeven w/Breakup Fee (P2): The maximum premium Deutsche Borse could pay to acquire the NYSE that would result in a payoff to Deutsche Borse equal to that of the payoff fee (i.e., $340 million total payoff).

Maximum Premium by CME that Equals Lost Monopoly Rents @ M (P3): The maximum premium CME could pay to acquire the NYSE such that the merger payoff would equal the payoff to CME in the initial duopoly/no initial CME bid scenario (i.e., a $2.1 billion total payoff).

Maximum Premium by CME to breakeven (P4): The maximum premium CME could pay to acquire the NYSE such that the merger payoff would result in a $0.0 payoff to CME.
NYSE Pre-Merger Enterprise Value: NYSE's pre-merger announcement enterprise value (based on the 2/8/2011 closing stock price).

Initial DeutcheBorse Bid (2/9/2011): Based on press release data.

Announced annual DB/NYSE Synergies: Pre-tax annual savings based on press release data.[8]

[8] *D Borse and NYSE Unveil Deal Terms*. Financial Times. February 15, 2011.

Forecasted CME/NYSE Synergies: Pre-tax annual savings assumed to be the same as those realized by a combined DB/NYSE.

Duopoly Price War Discount Factor: The discount assigned to the present value of CME's monopoly rents in the Interest Rate Futures market as a result of a more competitive duopoly price environment.