

Using Potential Future Exposure (PFE) to Evaluate Credit and Liquidity Risk

Mid-C Seminar, 2017

Credit risk profiles differ under changing pricing environments:

When a trade takes place and prices are migrating lower:

- **Seller** will generally have both A/R and MTM credit risk.
- **Buyer** will need to show that it has sufficient capital and liquidity to support both payment on deliveries and collateral calls to cover MTM if prices fall.

When a trade takes place and prices are migrating higher:

- **Seller** will have A/R credit risk.
- **Buyer** will have MTM credit risk.
- Both parties may need to show that they have sufficient capital and liquidity to support either payment on deliveries (buyer) or MTM risk (Seller).

How can we estimate the credit exposure risks and resulting liquidity needs for each party throughout the term of the transaction(s)?

Credit Exposure: Liquidated Damages from Counterparty Default

Current Exposure – a point in time estimate of the financial loss that would be incurred if a given counterparty were to default on its obligations under its existing transactions.

Current Exposure =	Unpaid A/R Plus Accrued Accounts Receivable	Plus Positive MTM Value of Open Trades (netted if agreements are in place)	Plus Any of Your Co. Cash Margin Held by the Counterparty	Less Counterparty Collateral Held by Your Co.
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Expected Exposure – the value of credit exposure with a counterparty at discrete points in time throughout the course of existing transactions at current forward prices.

Potential Exposure – additional credit exposure that may result from potential movements in forward market prices. Potential price movements are normally based upon statistical estimates.

Liquidity Needs: Capital and liquidity to meet credit/collateral requirements

Creditworthiness and Capital Support – financial strength of company to support open trade credit and/or financial strength of parent for guarantee support

Available liquidity – Available cash plus availability under credit facilities to provide letters of credit and/or cash to meet collateral requirements

ConocoPhillips

(Rated A-/Baa2/A-)

Total Assets	\$89.8 billion
Total Equity	\$35.0 billion
TNW	\$27.0 billion

AVAILABLE LIQUIDITY					YE 2016
in millions \$	Expires	Total	Used	LC's Issued	Available
Cash & Equivalents	\$	3,610	-	-	3,610
CREDIT FACILITIES:					
Revolving Facility	Jun-19 \$	6,250	-	-	6,250
Revolving Facility	Jun-19 \$	500	-	-	500
Total Credit Facilities	\$	6,750	-	-	6,750
Total Available Liquidity	\$	10,360	-	-	10,360

Smaller Municipal

(Rated NR/A2/A-)

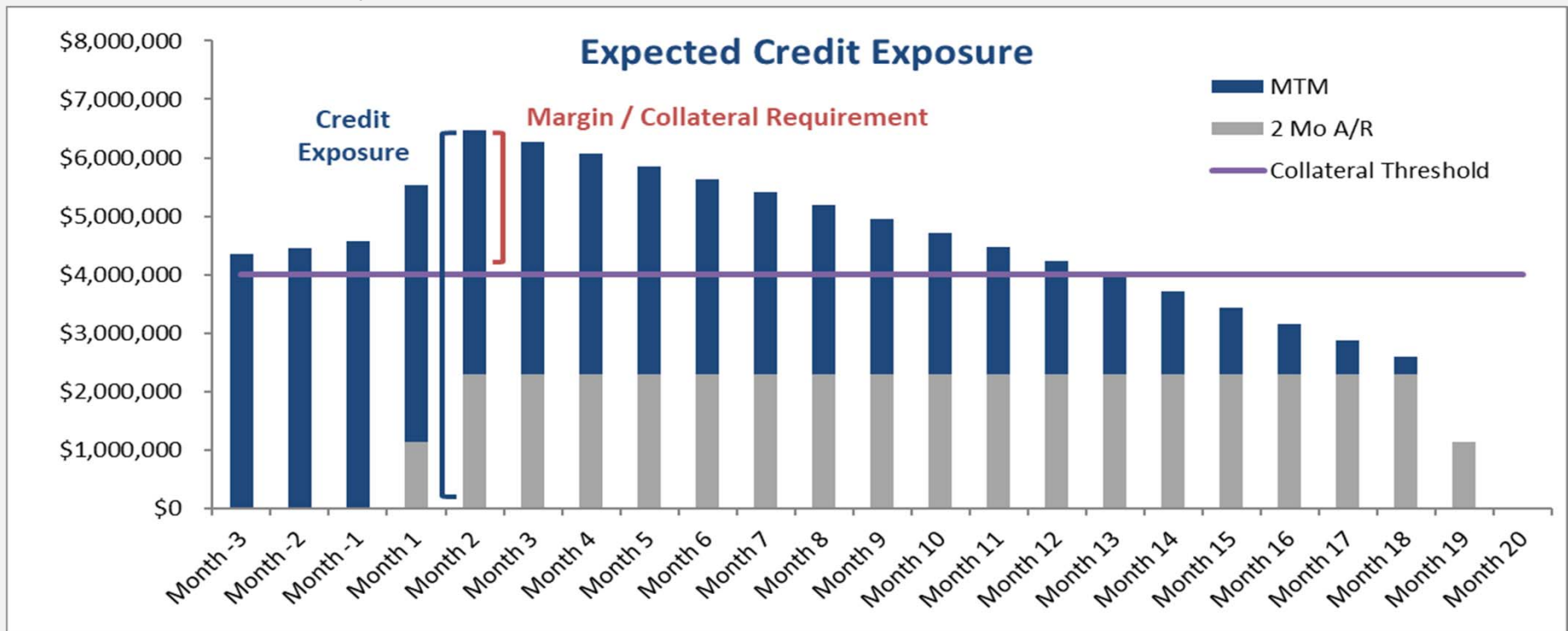
Total Assets	\$289.8 million
Total Equity	\$ 94.6 million
TNW	\$ 70.4 million

AVAILABLE LIQUIDITY as of:					YE 2015
in millions \$	Expires	Total	Used	LC's Issued	Available
Cash & Equivalents	\$	15.8	-	-	15.8
Rate Stabilization Acct.	\$	3.3	-	-	3.3
CREDIT FACILITIES:					
Line of Credit	Aug-17 \$	2.5	-	-	2.5
Total Credit Facilities	\$	2.5	-	-	2.5
Total Available Liquidity	\$	21.6	-	-	21.6

How does credit exposure shape across the term of a transaction?

Example: 18 month sale of 10,000 MMBtu at \$3.75; price drops to \$2.75

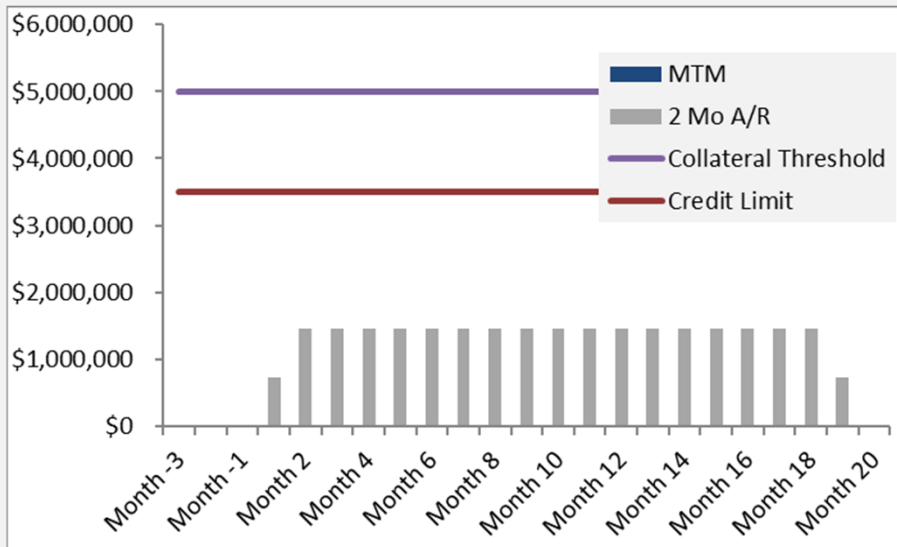
Profile of credit exposure on **Seller's** books (seller has both A/R & MTM exposure):



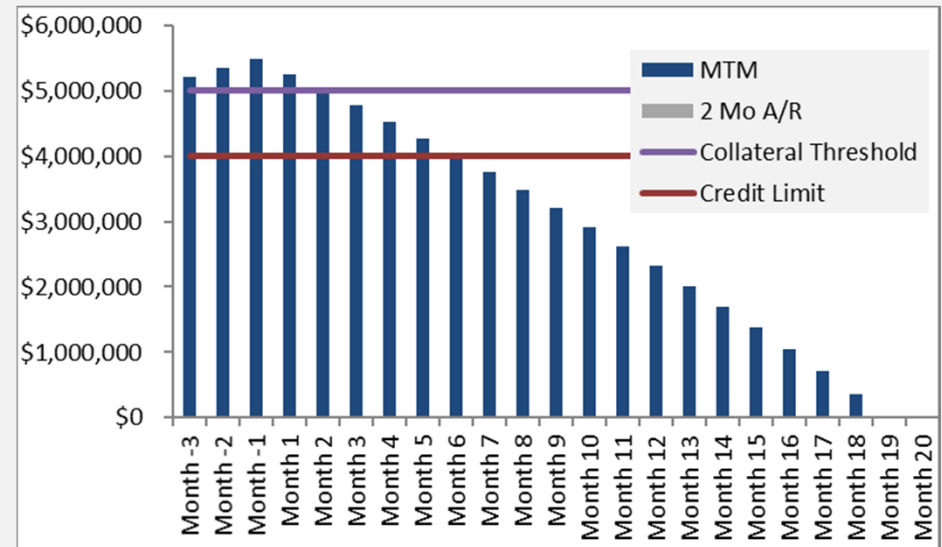
Note that credit exposure can exist for both the buyer and seller on the same transaction.

Example: 18 month purchase of 50 MW flat load at \$20/MW;
price climbs to \$30/MW

Seller's Expected credit exposure (A/R)



Buyer's Expected credit exposure (MTM)



Potential Future Exposure (PFE)

PFE uses historical forward curve data and a Monte Carlo engine to randomly simulate a large number of estimates of forward curves, ranks those outcomes, and returns a result for a chosen level of confidence.

Forward curves are generated for discrete points in time throughout the life of a trade(s) and potential credit exposures are calculated for each point in time. The maximum of these amounts is the PFE.

Note: PFE is different from:

Stress Testing

Stress testing for credit exposure applies either:

- (a) a shocked forward curve (example: all forward prices are increased or decreased by a set %) and recalculates the current credit exposure, or
- (b) uses a “worst case” example of a forward curve to recalculate the current credit exposure.

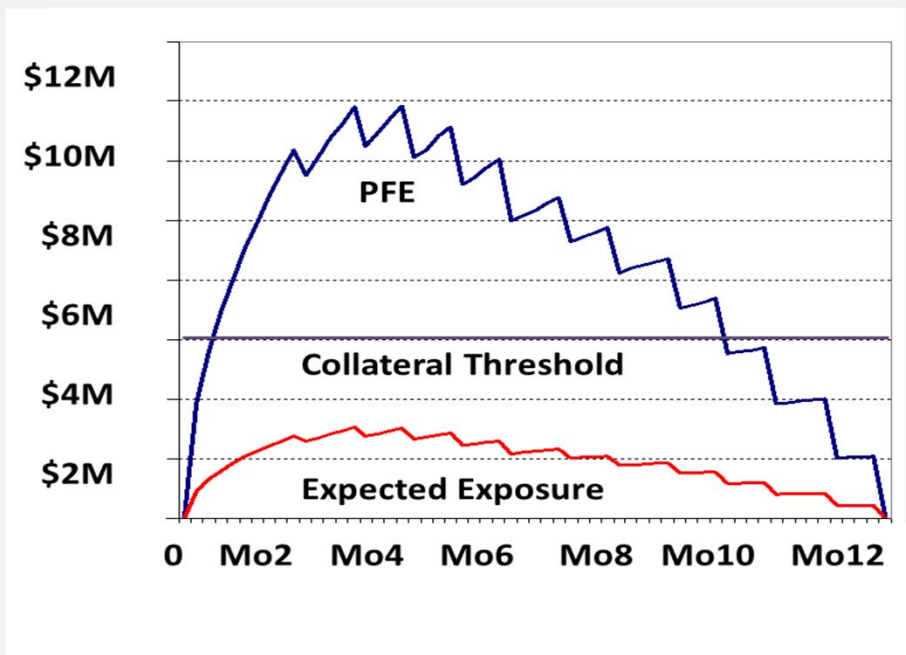
Potential Future Exposure (PFE) is a deterministic estimate of the effect on credit exposure of possible price movements over time.

Two competing effects:

- Price uncertainty increases over time
- Volume amortizes as contracts roll off

How much could my credit exposure increase as prices change?

How likely is it that I might get margin / collateral called?



Example: 12 month 25MW flat load sale at Mid-C at \$25/MW executed last year. It's June. Delivery doesn't start until September. What is the seller's expected credit exposure (EE), Potential Future Exposure (PFE) and Potential Margin Exposure (PME) on this trade?

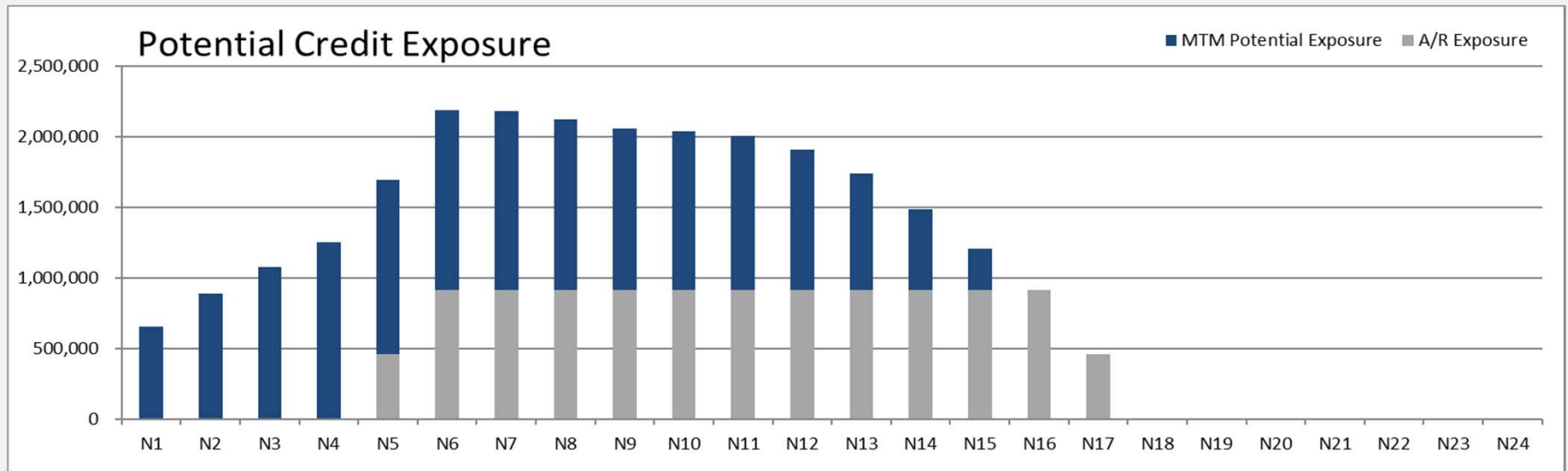
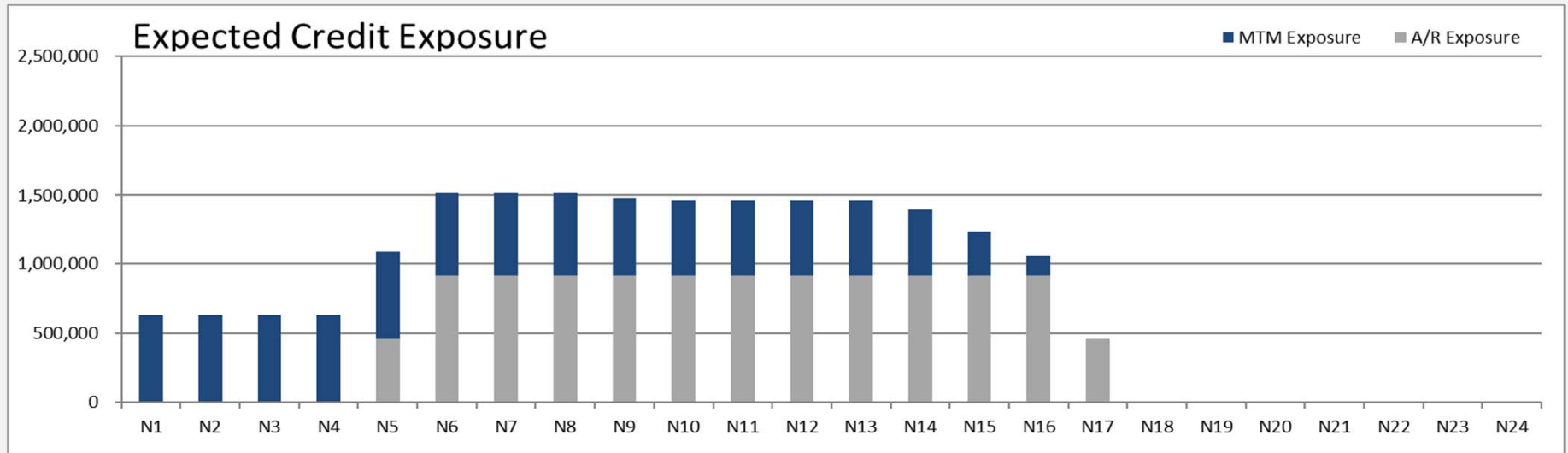
(Confidence level = 95% / 30,000 iterations)

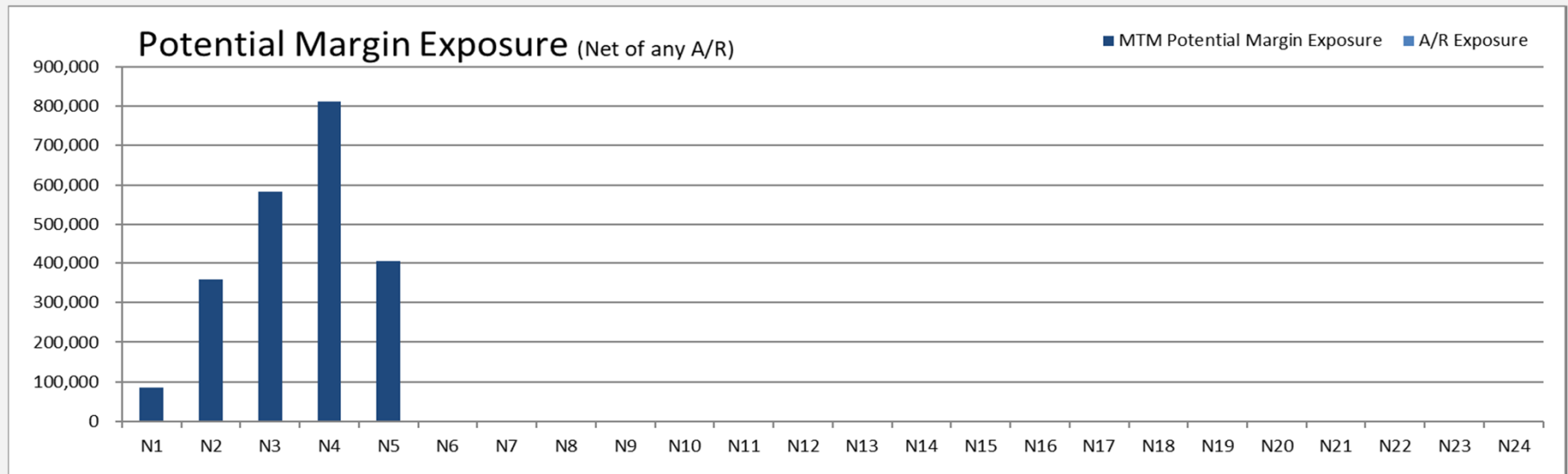
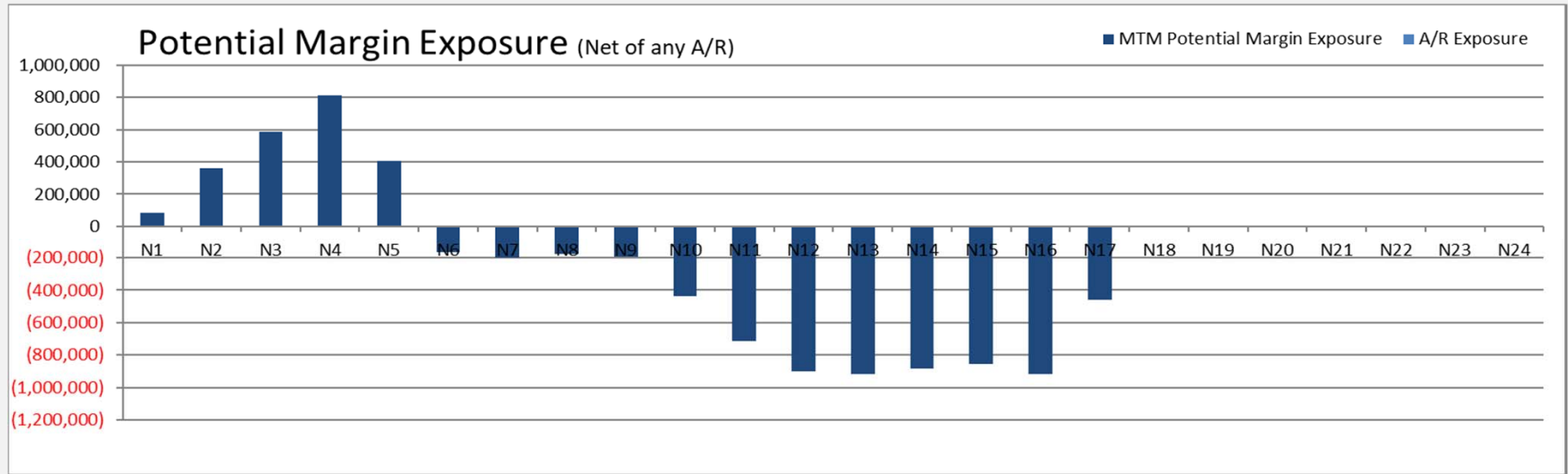
Current forward curve (\$16.38 / \$13.50 / \$12.35 / \$12.05 / \$23.45 / \$29.25 / \$26.50 / \$22.70 / \$24.5 / \$26.95 / \$30.40 / \$30.40 / \$26.95...)

PFE Forward Curves	Iteration	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16
N1	28500																
N2	28882		\$13.16	\$12.11	\$12.03	\$23.23	\$27.96	\$25.06	\$21.45	\$22.87	\$28.19	\$29.11	\$25.65	\$19.78	\$13.02	\$13.40	\$14.62
N3	12043			\$10.65	\$10.09	\$20.28	\$25.57	\$23.78	\$19.67	\$20.64	\$25.24	\$25.60	\$26.68	\$21.23	\$16.54	\$11.29	\$15.06
N4	5871				\$10.67	\$16.58	\$22.12	\$20.86	\$19.75	\$19.80	\$26.10	\$25.62	\$24.52	\$21.49	\$16.20	\$14.28	\$13.72
N5	17951					\$16.11	\$23.17	\$24.58	\$19.66	\$20.63	\$24.55	\$23.34	\$20.68	\$17.88	\$15.10	\$13.61	\$12.17
N6	16845						\$19.01	\$19.92	\$17.20	\$19.33	\$25.66	\$26.31	\$23.46	\$18.57	\$12.97	\$12.10	\$12.98
N7	5319							\$16.61	\$13.39	\$17.01	\$26.15	\$26.21	\$24.36	\$17.83	\$14.60	\$12.51	\$11.58
N8	22247								\$10.07	\$15.52	\$23.69	\$24.32	\$22.87	\$18.00	\$13.00	\$14.69	\$13.62
N9	28861									\$19.03	\$22.31	\$23.80	\$15.91	\$13.89	\$12.97	\$13.11	\$12.95
N10	9768										\$21.03	\$18.60	\$16.74	\$19.02	\$14.11	\$10.79	\$12.17
N11	25516											\$22.29	\$20.00	\$15.87	\$9.93	\$9.31	\$11.02
N12	800												\$18.07	\$12.83	\$12.75	\$10.17	\$11.52
N13	28182													\$10.46	\$10.29	\$10.16	\$14.61
N14	21700														\$10.18	\$11.35	\$8.46
N15	15907															\$9.75	\$9.15
N16	13484																\$9.12
N17	28500																

ME Forward Curves	Iteration	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16
N1	1500																
N2	9141		\$13.25	\$12.33	\$12.18	\$24.14	\$30.39	\$27.43	\$25.00	\$26.55	\$32.79	\$31.35	\$27.74	\$22.00	\$17.96	\$19.35	\$19.98
N3	2590			\$12.96	\$12.19	\$30.02	\$33.58	\$28.25	\$25.34	\$28.93	\$33.82	\$33.69	\$28.00	\$21.89	\$16.04	\$18.69	\$21.34
N4	28280				\$17.63	\$29.09	\$34.53	\$29.43	\$26.78	\$28.73	\$36.92	\$37.34	\$32.48	\$22.59	\$16.89	\$18.72	\$18.40
N5	24724					\$31.52	\$29.78	\$30.34	\$29.11	\$29.09	\$34.72	\$34.18	\$31.01	\$22.74	\$18.69	\$23.00	\$30.20
N6	21529						\$40.05	\$35.16	\$33.04	\$27.78	\$37.85	\$34.48	\$30.38	\$24.86	\$19.58	\$19.75	\$19.14
N7	29235							\$25.11	\$29.92	\$26.94	\$36.19	\$37.55	\$35.32	\$27.92	\$22.16	\$24.29	\$25.55
N8	3982								\$30.29	\$35.62	\$40.53	\$43.06	\$36.42	\$23.64	\$19.40	\$17.74	\$17.50
N9	9193									\$36.57	\$46.23	\$44.41	\$34.18	\$24.71	\$15.80	\$17.38	\$21.18
N10	17586										\$48.22	\$39.69	\$30.94	\$26.49	\$20.11	\$20.67	\$28.22
N11	288											\$37.40	\$40.24	\$34.79	\$22.90	\$19.86	\$20.79
N12	11839												\$37.76	\$36.74	\$20.55	\$22.77	\$18.21
N13	6921													\$26.99	\$27.53	\$26.33	\$19.96
N14	273														\$6.46	\$10.17	\$15.01
N15	7626															\$25.20	\$26.47
N16	25630																\$28.21
N17	1500																

Potential Future Exposure (PFE)





MTM on a fixed price trade or A/R on an index trade normally increase as a transaction's term lengthens, volumes are higher and/or prices have more room to move.

Prices have been at historic lows at Mid-C so both buyers and sellers should be focused on their potential credit risk and liquidity needs.

Credit and trading departments that are not evaluating forward exposure profiles are missing much of what's needed to evaluate their deals and manage their credit and liquidity risk.

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