

CDIAC

ADVANCED CONCEPTS IN PUBLIC INVESTMENT ANALYTICS

JANUARY 17, 2018

**RAYMOND JOHNSON
BLOOMBERG L.P.
FIXED INCOME SPECIALIST**

FRAMING UP CURRENT MARKET ENVIRONMENT

RATES

INFLATION AND GDP

FED POLICY

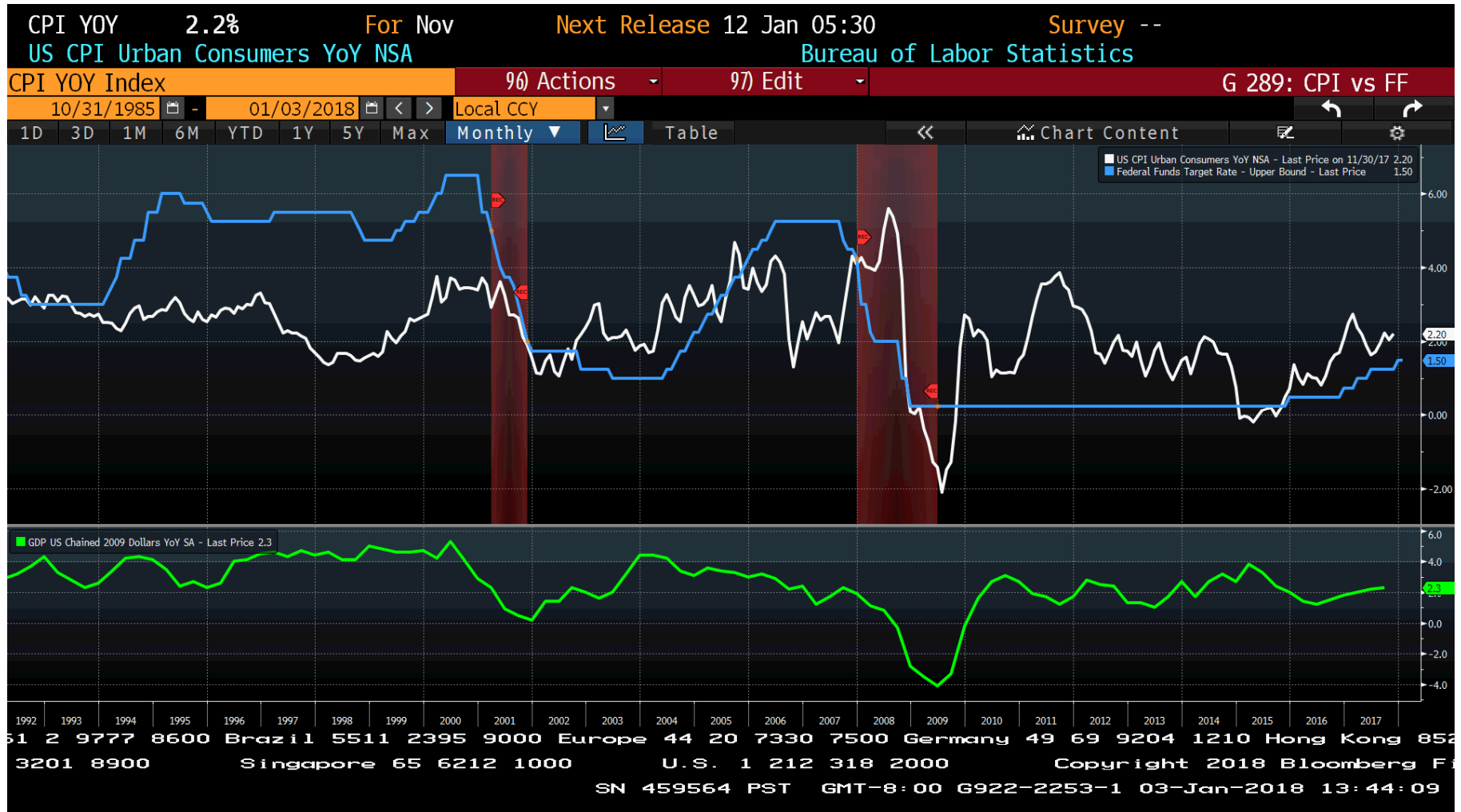
YIELD CURVE ANALYSIS

CREDIT SPREADS

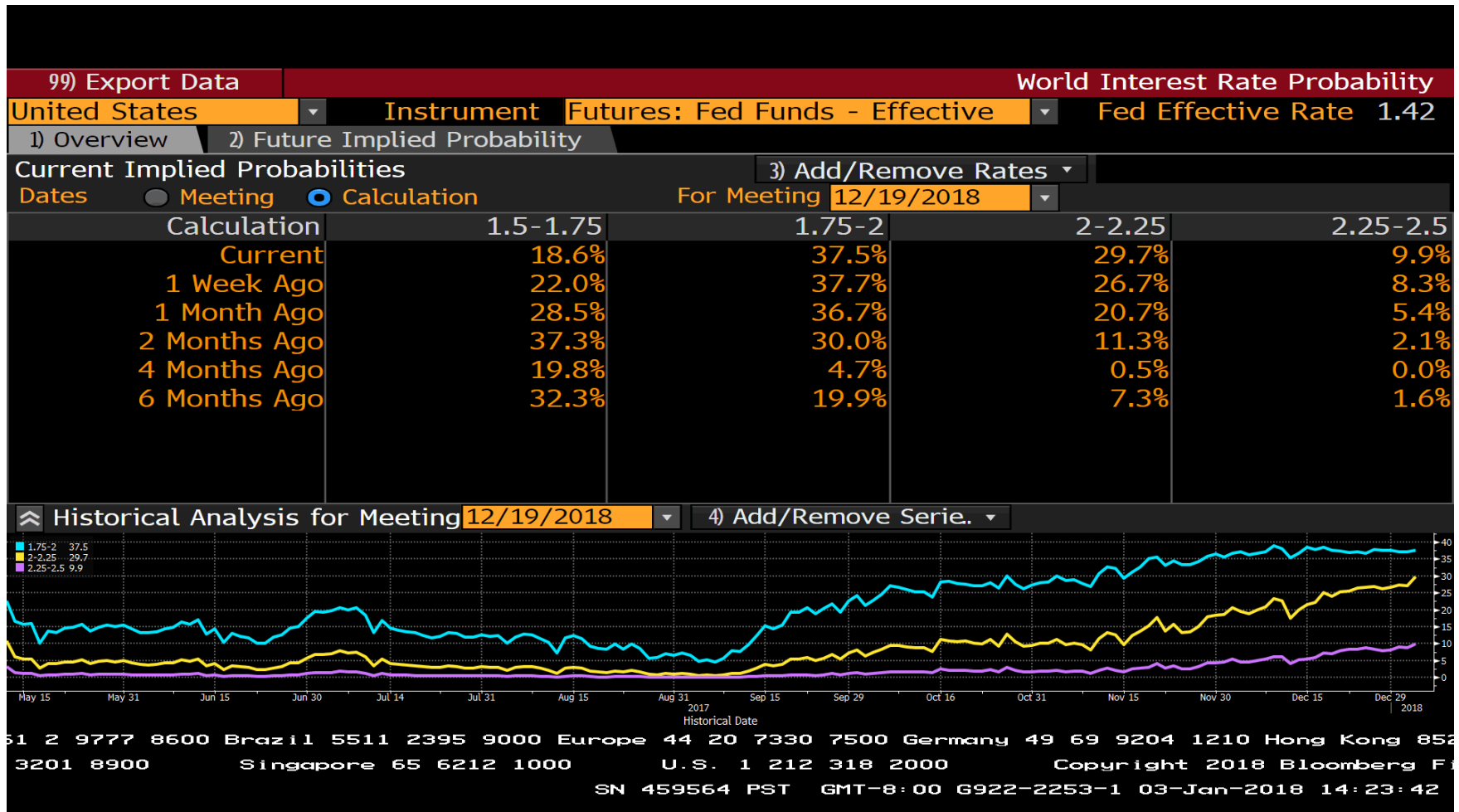
GOVERNMENT RATES AND FED FUNDS UP



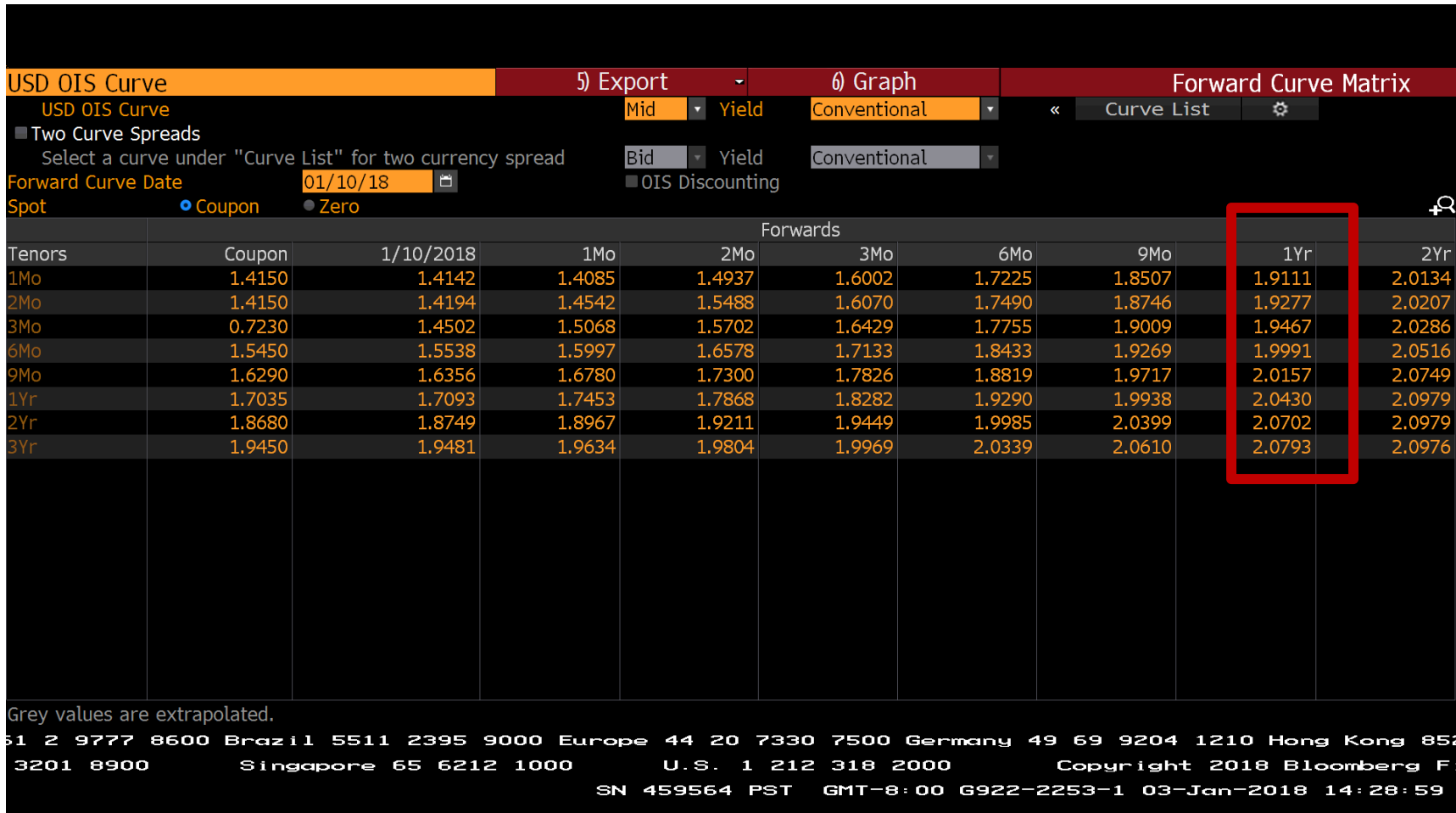
HISTORICAL PERSPECTIVE – FF VS CPI



MONITORING FED POLICY - LOOKING TO DEC 2018



YIELD CURVE ANALYSIS IS CONSISTENT WITH WIRP



FED FUNDS FUTURES PREDICTING 2-3 HIKES 2017

| FF1 COMB Comdty | | 1) Actions | | | 2) Settings | | | Futures Contract Table | | | |
|--------------------|----------|----------------|--------|------|------------------|--------|-------------------------|------------------------|----------|--------|--|
| Generic 1st 'FF' F | | As of 01/04/18 | | | Session COMB | | First Leg All | | | | |
| 7) CBT CEM » | | Contracts 36 | | | Aggr Vol 160,543 | | Aggr Open Int 1,395,717 | | Length 0 | | |
| Display Quoted Val | | Rate | | | 9) Color Legend | | | | | | |
| Description | Last | Chg | Settle | Time | Bid | Ask | Open Int | Volume | Yest | Settle | |
| 21) Jan18 | 1.4100 s | -- | -- | 1/3 | 1.4125 | 1.4100 | 264290 | 9956 | 1.4100 | | |
| 22) Feb18 | 1.410 s | -- | -- | 1/3 | 1.415 | 1.410 | 200920 | 4431 | 1.410 | | |
| 23) Mar18 | 1.470 s | -- | -- | 1/3 | 1.475 | 1.465 | 73656 | 15984 | 1.470 | | |
| 24) Apr18 | 1.595 s | -- | -- | 1/3 | 1.600 | 1.590 | 177155 | 63779 | 1.595 | | |
| 25) May18 | 1.610 s | -- | -- | 1/3 | 1.615 | 1.610 | 72543 | 15833 | 1.610 | | |
| 26) Jun18 | 1.685 s | -- | -- | 1/3 | 1.690 | 1.685 | 34898 | 4180 | 1.685 | | |
| 27) Jul18 | 1.755 s | -- | -- | 1/3 | 1.760 | 1.750 | 95010 | 6745 | 1.755 | | |
| 28) Aug18 | 1.775 s | -- | -- | 1/3 | 1.780 | 1.775 | 67339 | 3575 | 1.775 | | |
| 29) Sep18 | 1.775 s | -- | -- | 1/3 | 1.780 | 1.775 | 36354 | 2431 | 1.775 | | |
| 30) Oct18 | 1.875 s | -- | -- | 1/3 | 1.880 | 1.875 | 68426 | 3778 | 1.875 | | |
| 31) Nov18 | 1.885 s | -- | -- | 1/3 | 1.890 | 1.885 | 63860 | 2356 | 1.885 | | |
| 32) Dec18 | 1.910 s | -- | -- | 1/3 | 1.920 | 1.910 | 22610 | 2651 | 1.910 | | |
| 33) Jan19 | 1.955 s | -- | -- | 1/3 | 1.965 | 1.955 | 151190 | 15950 | 1.955 | | |
| 34) Feb19 | 1.960 s | -- | -- | 1/3 | 1.970 | 1.960 | 44251 | 4110 | 1.960 | | |
| 35) Mar19 | 1.975 s | -- | -- | 1/3 | 1.980 | 1.970 | 6372 | 959 | 1.975 | | |
| 36) Apr19 | 2.010 s | -- | -- | 1/3 | 2.015 | 2.005 | 7450 | 1877 | 2.010 | | |
| 37) May19 | 2.015 s | -- | -- | 1/3 | 2.020 | 2.010 | 2888 | 809 | 2.015 | | |
| 38) Jun19 | 2.030 s | -- | -- | 1/3 | | | 884 | 535 | 2.030 | | |
| 39) Jul19 | 2.055 s | -- | -- | 1/3 | | | 1508 | 197 | 2.055 | | |
| 40) Aug19 | 2.060 s | -- | -- | 1/3 | | | 687 | 99 | 2.060 | | |
| 41) Sep19 | 2.065 s | -- | -- | 1/3 | | | 135 | | 2.065 | | |
| 42) Oct19 | 2.085 s | -- | -- | 1/3 | | | 205 | 21 | 2.085 | | |

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CREDIT SPREADS CONTINUE TO TIGHTEN



CREDIT SPREADS – TIGHTER ACROSS THE BOARD



INDIVIDUAL SECURITY RISK

- What is Price?
- Modified vs Effective Duration
- Dollar Value of Basis Point (DV01)
- Convexity
- Cost of Carry
- Spread Duration vs. Interest Rate Duration
- Horizon Analysis and Quantifying Returns
- Option Adjusted Spread Analysis

WHAT IS PRICE? US TREASURIES/AGENCIES

| T 2 1/8 12/31/22 Govt | | Stop Monitoring | Settings | All Quotes | |
|-----------------------|-----------------------|--|-------------------|------------|------------|
| 14:56:27 | ALLX Mode | Overlay Axes | Split Bid/Offer | 94) Switch | 95) Buy |
| Spreads vs | T 2 1/8 12/31/22 Govt | 99-13 ³ / ₄ / 99-14 | 2.246 / 2.245 | / | 96) Sell |
| Edit Filters | Venue | BGM | | | 93) Legend |
| PCS | Firm Name | Bid Px / Ask Px | Bid Yld / Ask Yld | | Time |
| 20) CBBT | FIT COMPOSITE | 99-13 ³ / ₄ / 99-14 | 2.246 / 2.245 | | 13:59 |
| 21) MZHK | MIZUHO SECURITY ASIA | 99-14 ³ / ₄ / 99-15 | 2.240 / 2.238 | | 01/03 |
| 22) STGT | STUTT GART EXCHANGE | 99-16 / 99-16 ⁵ / ₈ | / | | d08:48 |
| 23) GETX | GETTEX | 99-15 / 99-15 ¹ / ₄ | / | | 08:02 |
| 24) MNCH | MUNICH EXCHANGE | 99-15 / 99-15 ¹ / ₄ | / | | d07:59 |
| 25) FRNK | FRANKFURT EXCH | 99-14 ¹ / ₄ / 99-15 ⁷ / ₈ | / | | d07:38 |
| 26) RBS | NatWest Markets | 99-14 ¹ / ₄ / 99-14+ | 2.243 / 2.241 | | 14:55 |
| 27) IONT | TD TOMS TEST | 99-13 ³ / ₄ / 99-14 | 2.246 / 2.245 | | 14:55 |
| 28) CSFI | Credit Suisse Govts | 99-14 / 99-14 | 2.245 / | | 14:50 |
| 29) SCHK | SCB TEST DB | 99-31 ¹ / ₄ / 100-00 ³ / ₄ | 2.130 / 2.120 | | 14:45 |
| 30) WBCA | WESTPAC BANKING CORP | 99-13 ³ / ₄ / 99-14 | 2.246 / 2.245 | | 14:36 |
| 31) MS | MORGAN STANLEY NY | 99-14 ¹ / ₄ / 99-14+ | 2.244 / 2.241 | | 14:26 |
| 32) MSTY | Morgan Stanley - UST | 99-14 ¹ / ₄ / 99-14+ | 2.244 / 2.241 | | 14:26 |
| 33) FCSR | INTL FCStone Fin Inc | 99-13 ³ / ₄ / 99-15 | 2.246 / 2.238 | | 14:05 |
| 34) QCR | QC retail system | 99-29 ³ / ₄ / 99-30 | 2.140 / 2.138 | | 14:00 |
| 35) OPCO | OPPENHEIMER & CO. | 99-13 ³ / ₄ / 99-14 | 2.246 / 2.245 | | 14:00 |
| 36) LCM | LOOP CAPITAL MARKETS | 99-13 ³ / ₄ / 99-14 | 2.246 / 2.245 | | 14:00 |
| 37) DAB | DEUTSCHE BK-DAB | 99-13 ³ / ₄ / 99-14 | 2.246 / 2.245 | | 14:00 |
| 38) BULL | BULLTICK LLC | 99-13 ³ / ₄ / 99-14 | 2.246 / 2.245 | | 14:00 |
| 39) SUSF | SUSQUEHANNA FIN GRP | 99-13 ³ / ₄ / 99-14 | 2.246 / 2.245 | | 14:00 |
| 40) BBNY | BBVA | 99-13 ³ / ₄ / 99-14 | 2.246 / 2.245 | | 14:00 |
| 41) DAIW | Daiwa CapMkts AM | 99-13 ³ / ₄ / 99-14 | 2.246 / 2.245 | | 14:00 |
| 42) CBRA | Cabrera Capital Mkts | 99-13 ³ / ₄ / 99-14 | 2.246 / 2.245 | | 14:00 |

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WHAT IS PRICE? MONEY MARKET

95<G0> to Show Dealer List, <Menu> to Display Searches

CP 97) Trading Access 91) Searches 92) Settings Money Market Offerings

93) Refine Search DEFAULT Secondary Group by None 88) Sellback 89) Chart

Table RateRun

| Cusip | AskSz (M) | Issuer | Maturity | SD | Dsc/Cpn | AskYld | S&P | M | F | Reg | Dlr | Pgm |
|----------|-----------|------------------|----------|----|---------|--------|------|-----|-----|------|------|------|
| PP2R31G2 | 100,000 | ATLANTIC AST LLC | 04/09/18 | | 1.700 | 1.708 | A-1 | P-1 | F1 | 4.2A | JPM | CP |
| PPBT8PNH | 3,500 | DANSKE CORP | 04/09/18 | 1 | 1.650 | 1.657 | A-1 | P-1 | F1 | 4.2A | GS | CP |
| PPA02VZ2 | 1,000 | TELSTRA CORP LTD | 04/09/18 | | 1.680 | 1.688 | A-1 | P-1 | -- | 4.2A | JPM | CP |
| PP2R3MJB | 17,000 | TOYOTA MTR CRED | 04/09/18 | | 1.620 | 1.627 | A-1+ | P-1 | -- | 3a3 | BAML | CP |
| PP7F2K3T | 8,900 | TOYOTA MTR CRED | 04/10/18 | | 1.620 | 1.627 | A-1+ | P-1 | -- | 3a3 | BAML | CP |
| PP2R3P59 | 19,070 | DANSKE CORP | 04/13/18 | | 1.670 | 1.678 | A-1 | P-1 | F1 | 4.2A | JPM | CP |
| PP9W1P9I | 14,750 | UNILEVER CAPITAL | 04/18/18 | | 1.640 | 1.648 | A-1 | P-1 | F1 | 4.2A | BAML | CP |
| PP2R386L | 75,122 | ING (US) FUNDING | 04/23/18 | | 1.650 | 1.658 | A-1 | P-1 | -- | 3a3 | JPM | CP |
| PPBT8PHN | 25,000 | CANADA-GOV'T | 05/03/18 | 1 | 1.440 | 1.447 | A-1+ | P-1 | F1+ | 3a3 | CG | CP |
| PP2R3S25 | 100,000 | ERSTE ABWICKLUNG | 05/10/18 | 3 | 1.760 | 1.771 | A-1+ | P-1 | F1+ | 4.2A | BAML | CP |
| PP2R3HAU | 1,615 | OVERSEA-CHINESE | 05/14/18 | | 1.600 | 1.609 | A-1+ | P-1 | F1+ | 4.2A | BAML | CP |
| PP2N3HW0 | 1,475 | SUMITOMO MITSUI | 05/18/18 | | 1.689 | 1.700 | A-1 | P-1 | -- | 4.2A | FTNF | CP |
| PP3052G3 | 3,000 | AUST & NZ BANK | 05/30/18 | | 99.987 | 0.154 | A-1+ | P-1 | F1+ | 4.2A | BAML | CPIB |
| PPBT8PL9 | 3,500 | NATIXIS NY | 06/01/18 | 1 | 1.800 | 1.813 | A-1 | P-1 | F1 | 3a3 | CG | CP |
| PPM00DSA | 25,000 | ALPINE SEC LLC | 06/04/18 | | 1.750 | 1.763 | A-1 | P-1 | -- | 3c7A | CS | CP |
| PP9I2W50 | 5,000 | OVERSEA-CHINESE | 06/08/18 | | 100.001 | 0.186 | A-1+ | P-1 | F1+ | 4.2A | BNY | CPIB |
| PP3F1T17 | 20,000 | UBS AG LONDON | 06/12/18 | | 100.039 | 1.697 | A-1 | P-1 | F1+ | 4.2A | UBS | CPIB |
| PP9J240J | 6,800 | UBS AG LONDON | 06/15/18 | | 100.050 | 1.747 | A-1 | P-1 | F1+ | 4.2A | UBS | CPIB |
| PP9F4J2B | 21,000 | BANK NOVA SCO NY | 06/25/18 | | 100.000 | 0.182 | A-1 | P-1 | F1+ | 3a3 | BAML | CPIB |
| PP3T354I | 19,000 | CHARIOT FDG LLC | 07/02/18 | | 1.860 | 1.878 | A-1 | P-1 | -- | 4.2A | RBC | CP |
| PP3T354L | 30,000 | CHARIOT FDG LLC | 07/05/18 | | 1.860 | 1.878 | A-1 | P-1 | -- | 4.2A | RBC | CP |
| PP9U0QIC | 5,000 | UBS AG LONDON | 07/10/18 | | 100.063 | 0.135 | A-1 | P-1 | F1+ | 4.2A | UBS | CPIB |
| PP2J8RDF | 5,000 | ALPINE SEC LTD | 07/25/18 | | 1.850 | 1.870 | A-1 | P-1 | -- | 3c7A | CS | CP |

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WHAT IS PRICE? IG CORPORATE BONDS

| AAPL 2.4 05/03/23 | | \$↓ 98.849 | + .077 | 38.8 bp vs T 2.125 12/31/2022 | |
|----------------------------------|----------------------|---|----------|-------------------------------|----------|
| AAPL 2.4 05/03/23 Corp | | At 15:09 | | Source BMRK | |
| 15:10:10 | | Stop Monitoring | | Settings | |
| Spreads vs T 2 1/8 12/31/22 Govt | | 99-13 ³ / ₄ / 99-14 | | 2.246 / 2.245 | |
| Edit Filters | | Venue | | BGM | |
| PCS | Firm Name | Bid Px | Ask Px | Bid Spd | Ask Spd |
| 20) CBBT | FIT COMPOSITE | 98.682 | 99.046 | 42.1 | 34.7 |
| 21) UBAP | UBS ASIA | / | / | 47.3 | 37.4 |
| 22) HSCT | HSBC CreditPlace | / | / | 41.7 | 36.7 |
| 23) ODSB | ODDOSEYDLER BANK AG | / | / | 39.9 | 32.7 |
| 24) FRNK | FRANKFURT EXCH | 98.795 | 99.140 | 39.7 | 32.9 |
| 25) XTKT | TRAX Trade Price | 98.894 | Last Trd | 37.7 | / |
| 26) KAGR | RAIFFEISENLANDESBANK | / | / | 38.0 | 38.2 |
| 27) TRAC | FINRA - TRACE | 98.720 | Last Trd | 41.2 | Last Trd |
| 28) TRST | FINRA TRACE (<=1MM) | 98.720 | Last Trd | 41.2 | Last Trd |
| 29) TRL1 | FINRA TRACE (>=1MM) | 99.886 | Last Trd | 17.9 | Last Trd |
| 30) TRMT | FINRA TRACE (>=250M) | 99.886 | Last Trd | 17.9 | Last Trd |
| 31) STGT | STUTT GART EXCHANGE | 98.810 | 99.080 | 39.4 | 34.1 |
| 32) GERM | GERMAN EXCHANGE | 98.810 | 99.080 | 39.4 | 34.1 |
| 33) DUSS | DUSSELDORF EXCH | 98.850 | 98.850 | 38.6 | 38.8 |
| 34) RABX | RABOBANK CREDIT | / | / | 39.7 | 33.0 |
| 35) BRLN | BERLIN EXCHANGE | 98.760 | 99.030 | 40.4 | 35.1 |
| 36) MNCH | MUNICH EXCHANGE | 98.760 | 99.030 | 40.4 | 35.1 |
| 37) HMBG | HAMBURG EXCHANGE | 98.795 | 99.140 | 39.7 | 32.9 |
| 38) HNVR | HANOVER EXCHANGE | 98.760 | 99.030 | 40.4 | 35.1 |
| 39) CFAL | Cantor Fitz Algo | 98.849 | 99.000 | 38.6 | 35.7 |
| 40) BMRK | BBG REALTIME EVAL | 98.780 | 98.930 | 40.2 | 37.2 |
| 41) SWST | Hilltop Securities | 98.243 | 99.133 | 51.0 | 33.0 |
| 42) SN | STIFEL NICOLAUS | 98.536 | / | 45.0 | / |

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WHAT IS PRICE FOR AN INVESTMENT GRADE CORP?

JPM 2.295 08/15/21 Corp Settings Yield and Spread Analysis

95 Buy 96 Sell

1) Yield & Spread 2) Graphs 3) Pricing 4) Description 5) Custom 6) Calls

JPM 2.295 08/15/21 (46623EKG3)

| | | | |
|--------|--------------|--------|--------------------------------|
| Spread | 68.00 bp | vs | 5y T 1 7 _s 02/28/22 |
| Price | 98.338272 | | 99-10+ 11:59:15 |
| Yield | 2.698 | Wst | 2.018331 S/A |
| Wkout | 08/15/2021 @ | 100.00 | Consensus Yld 3 6 |
| Settle | 03/22/17 | | 03/20/17 |

Risk

| | |
|---------|-------|
| Workout | OAS |
| 4.140 | 4.065 |
| 4.081 | 4.007 |
| 0.197 | 0.082 |
| 408 | 401 |
| 4.667 | 4.706 |
| 875 M | 852 M |
| | 991 M |

Invoice

| | |
|-------------------|------------|
| Face | 1,000 M |
| Principal | 983,382.72 |
| Accrued (37 Days) | 2,358.75 |
| Total (USD) | 985,741.47 |

Spreads

| | |
|-----------|-------|
| 1) G-Sprd | 79.5 |
| 2) I-Sprd | 64.0 |
| 3) Basis | -13.3 |
| 4) Z-Sprd | 64.4 |
| 5) ASW | 62.4 |
| 6) OAS | 73.2 |
| 7) TED | -58.7 |

Yield Calculations

| | |
|-------------------|-------|
| Street Convention | 2.698 |
| Equiv 1 /Yr | 2.716 |
| Mmkt (Act/ 360) | |
| True Yield | 2.696 |
| Current Yield | 2.334 |

After Tax (Inc 43.400% CG 23.800%) 1.605

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SPREAD ANALYSIS: BENCHMARK VS G-SPREAD

JPM 2.295 08/15/21 Corp Settings Yield and Spread Analysis

95 Buy 96 Sell

1) Yield & Spread 2) Graphs 3) Pricing 4) Description 5) Custom 6) Calls

JPM 2.295 08/15/21 (46623EKG3)

| | | | | | | |
|--------|---------------------|-----------|--------------------|--|---------|-------|
| Spread | 68.00 bp | vs | 5yT 1 7/8 02/28/22 | Risk | Workout | OAS |
| Price | 98.338272 | | 99-10+ 11:59:15 | <input checked="" type="radio"/> M.Dur <input type="radio"/> Dur | 4.140 | 4.065 |
| Yield | 2.698 | Wst | 2.018331 S/A | Risk | 4.081 | 4.007 |
| Wkout | 08/15/2021 @ 100.00 | Consensus | Yld 3 6 | Convexity | 0.197 | 0.082 |
| Settle | 03/22/17 | 03/20/17 | | DV 01 on 1MM | 408 | 401 |
| | | | | Benchmark Risk | 4.667 | 4.706 |
| | | | | | 875 M | 852 M |
| | | | | | | 991 M |

| | | | |
|------------------------------------|-------|--------------------|-------|
| Spreads | | Yield Calculations | |
| 11) G-Sprd | 79.5 | Street convention | |
| 12) I-Sprd | 64.0 | Equiv 1 /Yr | |
| 13) Basis | -13.3 | Mmkt (Act/ 360) | |
| 14) Z-Sprd | 64.4 | True Yield | 2.696 |
| 15) ASW | 62.4 | Current Yield | 2.334 |
| 16) OAS | 73.2 | | |
| 17) TED | -58.7 | | |
| After Tax (Inc 43.400% CG 23.800%) | | | 1.605 |

Benchmark Spread vs G-Spread.

| | |
|-------------------|------------|
| Accrued (3/ Days) | |
| Total (USD) | 985,741.47 |
| | 1,000 M |
| | 983,382.72 |
| | 2,358.75 |

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DURATION: MACAULAY/MODIFIED/RISK/CONVEXITY

| YA | | Bond Matures on a SATURDAY | | Settings | | Yield and Spread Analysis | |
|--|-----------------|----------------------------|------------|--------------|-------------------|---------------------------|---------|
| T 2 1/8 12/31/22 Govt | | | | CBBT @ 13:59 | | 95 Buy 96 Sell | |
| 99-13 3/4 /99-14 | | 2.246/2.245 | | | | | |
| 1) Yield & Spread | | 2) Yields | | 3) Graphs | | 4) Pricing | |
| 5) Description | | 6) Custom | | | | | |
| T 2 1/8 12/31/22 (912828N30) | | | | Risk | | | |
| Price | 99-14 (99.4375) | | | Duration | 4.758 | | |
| Settle | 01/04/18 | Maturity | 12/31/2022 | | Modified Duration | 4.705 | |
| | | | | Risk | 4.680 | | |
| | | | | Convexity | 0.251 | | |
| Street Convention | 2.244784 | | | | DV | 01 on 1MM | 468 |
| Treasury Convention | 2.244756 | | | | YV | 0.031 | 0.00668 |
| True Yield | 2.241175 | | | | Invoice | | |
| Equiv 1 /Yr Compound | 2.257382 | | | | Face | 1,000 M | |
| Japanese Yield (Simple) | 2.250000 | | | | Principal | 994,375.00 | |
| Mmkt (Act/ 360) | | | | | Accrued (4 Days) | 234.81 | |
| Current Yield | 2.137 | | | | Total (USD) | 994,609.81 | |
| After Tax (Inc 43.400% CG 23.800%) | 1.293467 | | | | | | |
| Issue Price = 99.436. OID Bond with Acquisition Prem. | | | | | | | |
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UNDERSTANDING RISK CHARACTERISTICS OF BONDS

| | | | | | | |
|---|--|------------------------------|-------------|--------------------------------------|------------------|--------------------|
| JPM 2.295 08/15/21 | | \$↑ 98.337 | + .254 | 67.1 bp vs T 1.875 02/28/2022 | | |
| | | As of 16 Mar | Vol 20.0MM | Source TRL1 | | |
| JPM 2.295 08/15/21 Corp | | Settings | Contact IR | Page 1/11 Security Description: Bond | | |
| | | 94) Notes | 95) Buy | 96) Sell | | |
| 25) Bond Description | | 26) Issuer Description | | | | |
| Pages | Issuer Information | | Identifiers | | | |
| 11) Bond Info | Name | JPMORGAN CHASE & CO | | CUSIP | 46623EKG3 | |
| 12) Addtl Info | Industry | Diversified Banks | | ISIN | US46623EKG34 | |
| 13) Covenants | Security Information | | ID Number | QZ1439269 | | |
| 14) Guarantors | Mkt Iss | Global | | Bond Ratings | | |
| 15) Bond Ratings | Country | US | Currency | S&P A- | | |
| 16) Identifiers | Rank | Sr Unsecured | Series | Moody's A3 | | |
| 17) Exchanges | Coupon | 2.295000 | Type | Fitch A+ | | |
| 18) Inv Parties | Cpn Freq | S/A | Iss Price | Composite A- | | |
| 19) Fees, Restrict | Day Cnt | 30/360 | 100.00000 | Issuance & Trading | | |
| 20) Schedules | Maturity | 08/15/2021 | | Amt Issued/Outstanding | | |
| 21) Coupons | MAKE WHOLE @20.000000 until 08/15/20/ CALL 08/15/20@1... | | | | USD | 2,500,000.00 (M) / |
| Quick Links | Iss Sprd | 123.00bp vs T 1 1/8 07/31/21 | | USD | 2,500,000.00 (M) | |
| 32) ALLQ Pricing | Calc Type | (1)STREET CONVENTION | | Min Piece/Increment | | |
| 33) QRD Quote Recap | Announcement Date | 08/03/2016 | | 1,000.00 / 1,000.00 | | |
| 34) TDH Trade Hist | Interest Accrual Date | 08/08/2016 | | Par Amount | 1,000.00 | |
| 35) CACS Corp Action | 1st Settle Date | 08/08/2016 | | Book Runner | JPM-sole | |
| 36) CF Prospectus | 1st Coupon Date | 02/15/2017 | | Reporting | TRACE | |
| 37) CN Sec News | | | | | | |
| 38) HDS Holders | | | | | | |
| 39) VPRD Underly Info | | | | | | |
| 66) Send Bond | | | | | | |
| 51 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 | | | | | | |
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| SN 459564 PDT GMT-7:00 H336-723-1 17-Mar-2017 10:16:47 | | | | | | |

RISK: DURATION, DV01 AND CONVEXITY

JPM 2.295 08/15/21 Corp Settings Yield and Spread Analysis

95 Buy 96 Sell

1) Yield & Spread 2) Graphs 3) Pricing 4) Description 5) Custom 6) Calls

JPM 2.295 08/15/21 (46623EKG3)

| | | | |
|--------|--------------|--------|--------------------|
| Spread | 68.00 bp | vs | 5y T 1 7s 02/28/22 |
| Price | 98.338272 | | 99-10+ 11:59:15 |
| Yield | 2.698 | Wst | 2.018331 S/A |
| Wkout | 08/15/2021 @ | 100.00 | Consensus Yld 3 6 |
| Settle | 03/22/17 | | 03/20/17 |

| | | | |
|--|---------------------------|---------|-------|
| Risk | | Workout | OAS |
| <input checked="" type="radio"/> M.Dur | <input type="radio"/> Dur | 4.140 | 4.065 |
| Risk | | 4.081 | 4.007 |
| Convexity | | 0.197 | 0.082 |
| DV 01 on 1MM | | 408 | 401 |
| Benchmark Risk | | 4.667 | 4.706 |
| Risk Hedge | | 875 M | 852 M |
| Proceeds Hedge | | | 991 M |

| | | | |
|----------------|------------|--------------------|-------|
| Spreads | | Yield Calculations | |
| 1) G-Sprd | 79.5 | Street Convention | 2.698 |
| 2) I-Sprd | 64.0 | Equiv 1 /Yr | 2.716 |
| 3) Basis | -13.3 | Mmkt (Act/ 360) | |
| 4) Z-Sprd | 64.4 | True Yield | 2.696 |
| 5) ASW | 62.4 | Current Yield | 2.334 |
| 6) OAS | 73.2 | | |
| 7) TED | -58.7 | | |
| After Tax (Inc | 43.400% CG | 23.800%) | 1.605 |

| | |
|-------------------|------------|
| Invoice | |
| Face | 1,000 M |
| Principal | 983,382.72 |
| Accrued (37 Days) | 2,358.75 |
| Total (USD) | 985,741.47 |

51 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852
3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2017 Bloomberg F
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CARRY ANALYSIS:

JPM 2.295 08/15/21 Corp Settings Yield and Spread Analysis

1) Yield & Spread 2) Graphs 3) Pricing 4) Description **5) Custom** 6) Calls

JPM 2.295 08/15/21 (46623EKG3) FPA

| | | | | | | | | | |
|--------|--------------|--------|---------------------|----------------|-----------|-----------|------------|----------|---|
| Spread | 68.00 bp | vs | 5y T 1 7/8 02/28/22 | Repo Rate | 0.75 | Days | 90 | Amt (MM) | 1 |
| Price | 98.338272 | | 99-10+ | Fwd Prc | 97.962099 | Money At | | | |
| Yield | 2.698 | Wst | 2.018331 | Price Drop | 0.376173 | Settle | 985,741.47 | | |
| Wkout | 08/15/2021 @ | 100.00 | Consensus | Yld | 3 6 | Term | 987,589.74 | | |
| Settle | 03/22/17 | | 03/20/17 | Constant Yield | | Carry P&L | 4,630.54 | | |

Sprd/Yld

| | | | |
|------------|-------|-------------------|-------|
| 11) G-Sprd | 79.5 | Street Convention | 2.698 |
| 12) I-Sprd | 64.0 | | .716 |
| 13) Basis | -13.3 | | .696 |
| 14) Z-Sprd | 64.4 | | .334 |
| 15) ASW | 62.4 | | |
| 16) OAS | 73.2 | | |

SPRD Swap

US Dollar Swaps (30/360, S/A) (S23)

| Spread | Term | Rate (%) | Security |
|--------|--------|----------|-----------------------|
| +68.8 | 4yr | 2.010 | USSWAP4 |
| +64.0 | 4.42yr | 2.058 | I-Sprd (Interpolated) |
| +57.1 | 5yr | 2.127 | USSWAP5 |

HS

12/18/16 - 03/18/17 Period Daily

Custom tab allows access to Forward Pricing and Carry Analysis.

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HORIZON ANALYSIS:

JPM 2.295 08/15/21 \$↑ 98.337 +.254 67.1 bp vs T 1.875 02/28/2022
 As of 16 Mar Vol 20.0MM Source TRL1

JPM 2.295 08/15/21 Corp 97) Settings Fixed Income Horizon Analysis

1) Load CIX 2) Save as CIX 95) Buy 96) Sell

• Financing • Dur/Cvx • Tax Rates

| Swap Type | Input | Settlement | OAS | Horizon | Financing |
|--------------------|-------|------------|------------|-----------|------------|
| Security | B/S | Date | Price | Price | Yield |
| JPM 2.295 08/15/21 | B | 03/22/17 | 98,337,000 | 97.737638 | 3.000000 W |
| Add Security | | | | | |
| Add Security | | | | | |

B/E 3.54

Return Analysis

Reinvestment Rate 0.750% Income Tax 43.400% Capital Gains Tax 23.800%

4) View Cashflows Pre Tax After Tax

| | Total Return % | HPR % | MMKT % | Net P&L | Total Return % | HPR % | MMKT % | Net P&L |
|--------------------|----------------|-------|--------|---------|----------------|-------|--------|---------|
| JPM 2.295 08/15/21 | 1.719 | 1.726 | 1.703 | 17,017 | 0.855 | 0.857 | 0.846 | 8,442 |

Historical Yield 12/19/16 - 03/16/17 5) Expand

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SCENARIO ANALYSIS:

IB >12533297

JPM 2.295 08/15/21 Corp 98) Manage Scenarios 97) Settings Scenario Analysis

95) Buy 96) Sell

1) Load CIX 2) Save as CIX

| Security | Swap Type | Risk | Settlement Date | Price | Yield | Workout | OAS | Risk | Financing | Rate |
|--------------------|-----------|------|-----------------|-----------|----------|---------|-----|------|-----------|------|
| JPM 2.295 08/15/21 | B/S | | 03/22/17 | 98.337000 | 2.698311 | W | | 4.08 | | |
| <Add Security #2> | | | | | | | | | | |
| <Add Security #3> | | | | | | | | | | |

Scenario Results

Reinvestment Rate: 2.698%

Horizon Date: Multiple Horizon: 03/22/18

| Scenario Name | Total Return % | HPR % | Horizon Yield | Net P & L (USD) | B/E Yield |
|-----------------------|--------------------------|-------|---------------|-----------------|-----------|
| Target Horizon Yields | 25 | | | | 3.548 |
| +50 bps | 1.105 | 1.108 | 3.198 | 10,922 | |
| +25 bps | 1.899 | 1.908 | 2.948 | 18,812 | |
| 0 bps | 2.698 | 2.717 | 2.698 | 26,777 | |
| -25 bps | 3.502 | 3.532 | 2.448 | 34,819 | |
| -50 bps | 4.220 | 4.264 | 2.198 | 42,034 | |
| Historical Yield | | | | | |
| Curve Shifts() | 3) Edit Benchmark Curves | | | | |
| Zero Shift | 3.388 | 3.417 | 2.483 | 33,684 | |
| +10 bps Shift | 3.067 | 3.090 | 2.583 | 30,463 | |
| Steepener | 3.303 | 3.330 | 2.510 | 32,826 | |
| Implied Fwd Curve | 1.844 | 1.853 | 2.966 | 18,263 | |

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SPREAD DURATION VS INTEREST RATE DURATION.

| JPM Float 08/26/21 | | \$↓ 102.508 | -.019 | 102.166 / 102.850 | 2.187 / 2.028 |
|-------------------------|---|------------------------|--------------|----------------------------|---------------|
| | | At 9:15 | | -- X -- | Source BVAL |
| JPM Float 08/26/21 Corp | Settings | Contact IR | Page 1/11 | Security Description: Bond | |
| | | 94) Notes | 95) Buy | 96) Sell | |
| 25) Bond Description | 20) Issuer Description | | | | |
| Pages | Issuer Information | Identifiers | | | |
| 11) Bond Info | Name JPMORGAN CHASE & CO | CUSIP | 48125XJ64 | | |
| 12) Addtl Info | Industry Diversified Banks | ISIN | US48125XJ648 | | |
| 13) Covenants | Security Information | ID Number | EI7795871 | | |
| 14) Guarantors | Mkt Iss Domestic MTN | Bond Ratings | | | |
| 15) Bond Ratings | Country US | Currency | USD | | |
| 16) Identifiers | Rank Sr Unsecured | Series | MTN | | |
| 17) Exchanges | Coupon 2.602330 | Type | Floating | | |
| 18) Inv Parties | Formula QUARTLY US LIBOR +155.0000 | Bond Ratings | | | |
| 19) Fees, Restrict | Day Cnt 30/360 | Iss Price | 100.00000 | | |
| 20) Schedules | Maturity 08/26/2021 | Issuance & Trading | | | |
| 21) Coupons | BULLET | Amt Issued/Outstanding | | | |
| Quick Links | Iss Sprd | USD | | 25,000.00 (M) / | |
| 32) ALLQ Pricing | Calc Type (21)FLOAT RATE NOTE | USD | | 25,000.00 (M) | |
| 33) QRD Quote Recap | Announcement Date 08/10/2011 | Min Piece/Increment | | 1,000.00 / 1,000.00 | |
| 34) TDH Trade Hist | Interest Accrual Date 08/26/2011 | Par Amount | | 1,000.00 | |
| 35) CACS Corp Action | 1st Settle Date 08/26/2011 | Book Runner | | JPM | |
| 36) CF Prospectus | 1st Coupon Date 11/28/2011 | Reporting | | TRACE | |
| 37) CN Sec News | | | | | |
| 38) HDS Holders | | | | | |
| 39) VPRD Underly Info | | | | | |
| 66) Send Bond | | | | | |

SPREAD DURATION VS INTEREST RATE DURATION.

| JPM 0 08/26/21 Corp | | | Settings | Yield and Spread Analysis | | | |
|---|-------------------------------|--------------------------------|-----------------------|---------------------------|---------------------|-------------|----------|
| | | | | 95 Buy | 96 Sell | | |
| 1) Yield & Spread | | 2) Yields | | 3) Graphs | | 4) Pricing | |
| 5) Description | | 6) Custom | | | | | |
| JPM Float 08/26/21 (48125XJ64) | | | M/M Equiv to Next Fix | | Floater Cpn History | | |
| Price | 102.319304 | Settle | 03/22/17 | • ACT/360 | • ACT/365 | Date | Rate |
| DM (bp) | 100 | to Wst | | Price at Refix | 102.737987 | 02/27/17 | 2.60233 |
| Yield | 2.151780 | | | on 05/26/2017 | 65 Days | 05/26/17 | 0.00000 |
| Workout | 08/26/21 | @ | 100.00 | Mmkt | 4.762103 | | |
| SFL | 103.865 | | | | | | |
| Floater Information | | | | Risk | | | |
| Benchmark | US0003M | Assumed Rt | d 1.15178 | | | To 05/26/17 | OAS |
| Quoted Margin | 155.00 | Coupon | 2.60233 | Mod Duration | 0.181 | | 4.068 |
| Next Pay | 05/26/2017 | Coupon Freq | Quarterly | Risk | 0.186 | | 4.170 |
| | | Refix Freq | Quarterly | Convexity | 0.000656 | | 0.192671 |
| Index to | 05/26/2017 | 1.03826333 | d | DV 01 on 1MM | | 19 | 417 |
| OAS | 11) Floater Analysis YASN » | | | Invoice | | | |
| OAS | 127.7 | Option Premium | N.A. | Face | 1,000 M | | |
| Discount Curve | S42 | USD OIS | | Principal | 1,023,193.04 | | |
| Forward Curve | S23 | USD (30/360, S/A vs. 3M LIB... | | Accrued (25 Days) | 1,807.17 | | |
| Curve Shift (bp) | 0 | Z-Spread | -60.6 | Total (USD) | 1,025,000.21 | | |
| Vol Cube | VCUB | | | | | | |
| Fixed Equivalent Yield | | 08/26/21 | 3.0369 | | | | |
| 51 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 | | | | | | | |
| 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2017 Bloomberg F | | | | | | | |
| SN 459564 PDT GMT-7:00 H336-723-2 17-Mar-2017 10:37:18 | | | | | | | |

SPREAD DURATION VS INTEREST RATE DURATION.

| JPM 0 08/26/21 Corp | | | | Settings | Yield and Spread Analysis | | | | |
|--|-------------------------------|--------------------------------|-----------|--|-------------------------------|-------------|----------|---------------------|--|
| | | | | 95 Buy | | 96 Sell | | | |
| 1) Yield & Spread | | 2) Yields | | 3) Graphs | | 4) Pricing | | 5) Description | |
| 6) Custom | | | | | | | | | |
| JPM Float 08/26/21 (48125XJ64) | | | | M/M Equiv to Next Fix | | | | Floater Cpn History | |
| Price | 98.148142 | Settle | 03/22/17 | <input checked="" type="radio"/> ACT/360 | <input type="radio"/> ACT/365 | Date | Rate | | |
| DM (bp) | 200 | to Wst | | Price at Refix | 102.737987 | 02/27/17 | 2.60233 | | |
| Yield | 3.151780 | | | on 05/26/2017 | 65 Days | 05/26/17 | 0.00000 | | |
| Workout | 08/26/21 | @ | 100.00 | Mmkt | 28.458556 | | | | |
| SFL | 197.564 | | | | | | | | |
| Floater Information | | | | Risk | | | | | |
| Benchmark | US0003M | Assumed Rt | d 1.15178 | | | To 05/26/17 | OAS | | |
| Quoted Margin | 155.00 | Coupon | 2.60233 | Mod Duration | | 0.174 | 4.040 | | |
| Next Pay | 05/26/2017 | Coupon Freq | Quarterly | Risk | | 0.171 | 3.973 | | |
| | | Refix Freq | Quarterly | Convexity | | 0.000603 | 0.190298 | | |
| Index to | 05/26/2017 | 1.03826333 | d | DV 01 on 1MM | | 17 | 397 | | |
| OAS | 11) Floater Analysis YASN » | | | Invoice | | | | | |
| OAS | 230.2 | Option Premium | N.A. | Face | 1,000 M | | | | |
| Discount Curve | S42 | USD OIS | | Principal | 981,481.42 | | | | |
| Forward Curve | S23 | USD (30/360, S/A vs. 3M LIB... | | Accrued (25 Days) | 1,807.17 | | | | |
| Curve Shift (bp) | 0 | Z-Spread | 36.9 | Total (USD) | 983,288.59 | | | | |
| Vol Cube | VCUB | | | | | | | | |
| Fixed Equivalent Yield | | 08/26/21 | 4.0787 | | | | | | |
| 51 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2017 Bloomberg F SN 459564 PDT GMT-7:00 H336-723-2 17-Mar-2017 10:37:48 | | | | | | | | | |

OPTION ADJUSTED SPREAD ANALYSIS: OAS1

OAS1

61g47-139-I- **OPTION-ADJUSTED SPREAD ANALYSIS**
 FED FARM CREDIT FFCB 2.27 03/22 / (/) TRMT

Calculate **Price** **OAS (bp)** **Volatility**
 (P,0,V) P) 99.925 0) -7.57 V) 33.75

Cusip / ID# 3133EHDP5 Option Px Value: -1.61
 Settle 3/23/2017 Bench settle 3/20/2017 Vega: -0.05
 Spread 68.5bp vs3Y T 1 5/8 03/15/20 Govt@100-2 1/4 (1.601)

2) Customize
 Curve I111 Semi
 US On/Off The Run
 Dated 3/18/2017
 Settle 3/23/2017
 BLP Par Curve
 Shift +0(bps)
 Yield Adjust

{NUM}<GO> for:
 3) Call Schedule
 3/23/18 100.00

| | OAS Method | Option Free | To Call on 3/23/2018 | To Mty |
|-------|------------|-------------|----------------------|--------|
| Yld | | 1.947 | 2.346 | 2.286 |
| Sprd | | -7.8 | 137.0 | 26.1 |
| M Dur | 3.22 | | 0.98 | 4.70 |
| Risk | 3.22 | | 0.98 | 4.70 |
| Cnvx | -1.38 | | 0.01 | 0.25 |

Model L=Lognormal
 Exercise Premium 0.00

3m 0.726 -0.9
 6m 0.860 -0.9
 1y 0.980 -0.4
 2y 1.315 1.9
 3y 1.601 0.4
 4y 1.872 1.0
 5y 2.018 0.7
 7y 2.306 0.6
 10y 2.500 0.2
 20y 2.855 4.5
 30y 3.110 -0.2

88) REFRESH

51 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852
 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2017 Bloomberg F
 SN 459564 PDT GMT-7:00 H330-2151-2 18-Mar-2017 11:17:02

EVALUATION OF DEFAULT RISK

- Bloomberg's Quantitative Default Model
- Breakeven Market Observed Default Probabilities.

QUANTIFYING DEFAULT RISK

JPM 2.295 08/15/21 \$↑ 98.337 +.254 67.1 bp vs T 1.875 02/28/2022
 As of 16 Mar Vol 20.0MM Source TRL1

QZ143926@TRL1 Corp 96) Info 97) Upload 98) Settings **Bloomberg Default Risk**
 As of 3/16/2017

1) 1-Yr Default Risk **IG4** 2) 1-Yr Default Prob **0.0113%**

3) 5-Yr Model CDS 56 bps
 4) 5-Yr Market CDS 51 bps
 5) Market/Model CDS Ratio 0.911

Model Inputs (USD) Override 2016:Q4

| | |
|--------------------------|-----------------|
| 6) Share Price | 91.64 |
| 7) Market Cap | 327,334.70 MM |
| 8) Price Vol (1-Yr) | 20.22 % |
| 9) Effective ST Debt | 336,768 MM |
| 10) Long-Term Debt | 1,037,580.95 MM |
| 11) Total Debt | 1,374,348.95 MM |
| 12) Loan Loss Reserve | 13,776 MM |
| 13) NPL | 6,883 MM |
| 14) Effective Net Income | 6,329.5 MM |

20) Sector Comparison | DRAM »
 United States of America - Financials: Diversified Banks

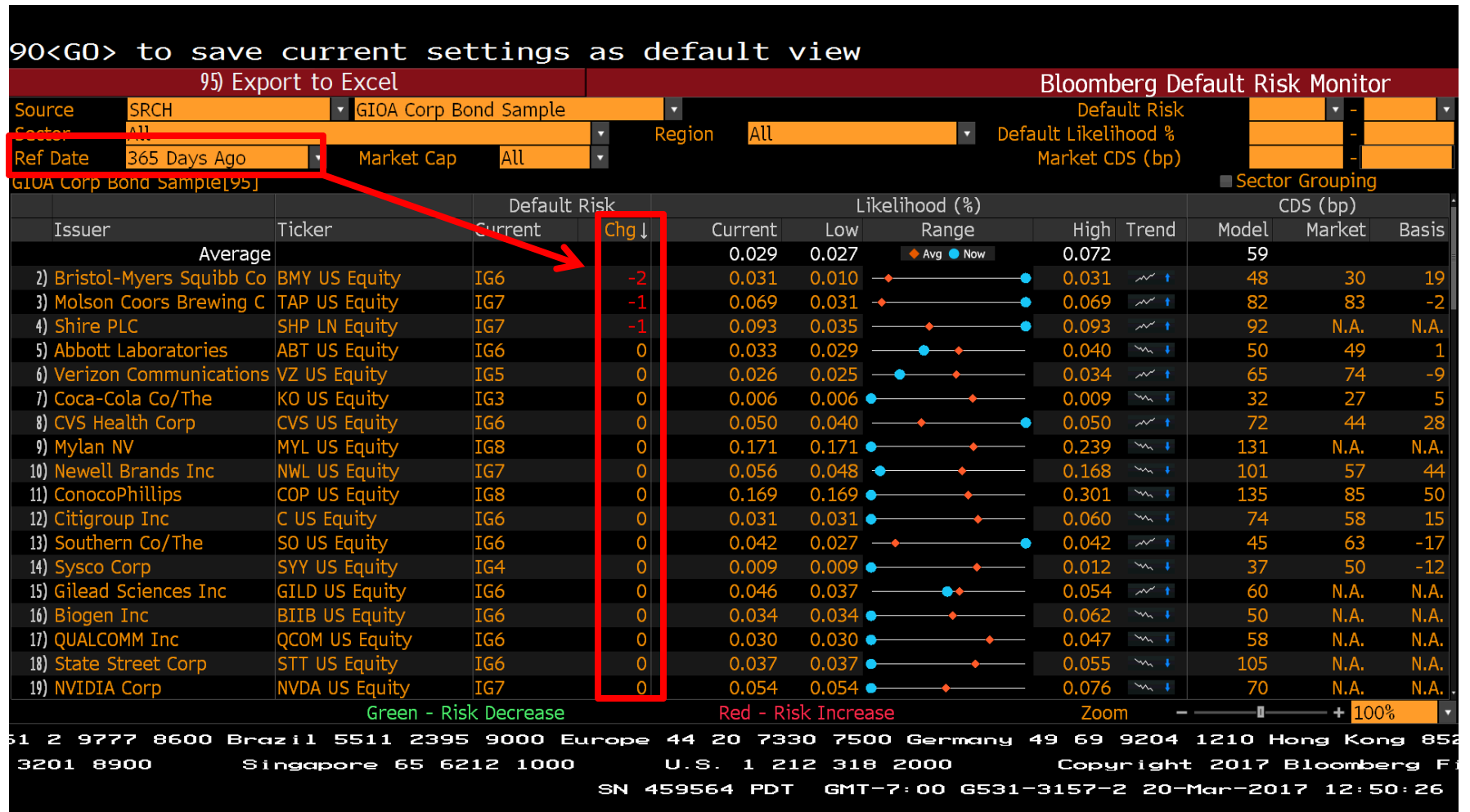
| Credit Metric | JPM | 10 Pctl | Range | 90 Pctl |
|----------------------|-------|---------|-------|---------|
| Debt/Equity (%) | 244.6 | 176.1 | | 240.0 |
| Return on Assets (%) | 1.0 | 0.8 | | 1.1 |
| LLR/NPL (%) | 200.1 | 120.7 | | 211.4 |
| Tier 1 Cap Ratio (%) | 14.1 | 12.5 | | 14.2 |
| Assets/Liab (%) | 111.4 | 111.4 | | 114.3 |

● JPM ● Median ● Wtd Avg

1-Year Default Risk Distribution

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 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2017 Bloomberg F
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MONITORING DEFAULT RISK ON A PORTFOLIO



BREAKEVEN DEFAULT RISK

| 90) Actions | | 91) Products | | 92) View | | 93) Settings | | Credit Default Swap Valuation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---------------------|----------------|---------------|-----------|----------|--------------|-----|-------------------------------|--|-------|--|--|------------|--|--|--|----------------------------------|--|--|--|-----------------|----------|----------------|----------|--------------------|----------|--|--|-----|----|--|--|-------|--------------|-------------|----------|-----------|----------|---------|-------|-------------------|---------|---------------|-------|-------------|----------|--------------|-----------|
| Cpty | CDS CNTRPART | Client | | CCP | OTC | Ticker | JPM | Series | | Deal# | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3) Load | | 3) Save | | 3) Ticket | | 3) Refresh | | 3) Send to VCON/TR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Deal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Buy | Notional | 10 MM | USD | Contract | 2014 | SNAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REF Entity | JPMorgan Chase & Co | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Debt Type | Senior | Restructuring | XR14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REF Obligation | US46623EKG34 | RED Pair Code | 4C933GAL0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trade Date | 03/17/17 | Trd Sprd (bp) | 52.9252 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1st Accr Start | 12/20/16 | Backstop Date | 01/16/17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1st Coupon | 03/20/17 | Coupon (bp) | 100.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pen Coupon | 09/20/21 | Day Cnt | ACT/360 | Freq | Q | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maturity | 5Y | 12/20/21 | Pay AI | True | Date Gen | I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Use curve recovery rate | True | | Business Days | 5D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recovery Rate | 0.40 | | Bus Day Adj | 1 | Amrt | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Market | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Curve Date | 03/17/17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Swap Curve | 260 | Mid | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5) View USD ISDA Standard Curve. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CDS Curve | C | CBIN | Ask | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6) <JPM USD Senior Curve> CDSD » | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recovery Rate | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Term | Pts Upf | Spread | Prob | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12/20/21 | -2.12432096 | 52.9252 | 0.0416 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| View | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Term Structure | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th colspan="4">Calculator</th> </tr> </thead> <tbody> <tr> <td colspan="4">ISDA Standard Upfront Model (I)*</td> </tr> <tr> <td>Cash Settled On</td> <td>03/22/17</td> <td>Valuation Date</td> <td>03/17/17</td> </tr> <tr> <td>Cash Calculated On</td> <td>03/22/17</td> <td colspan="2"></td> </tr> <tr> <td>EDD</td> <td>No</td> <td colspan="2"></td> </tr> <tr> <td>Price</td> <td>102.12432096</td> <td>Spread DV01</td> <td>4,594.04</td> </tr> <tr> <td>Principal</td> <td>-212,433</td> <td>IR DV01</td> <td>51.39</td> </tr> <tr> <td>Accrued (88 Days)</td> <td>-24,444</td> <td>Rec Risk (1%)</td> <td>73.38</td> </tr> <tr> <td>Cash Amount</td> <td>-236,877</td> <td>Def Exposure</td> <td>6,212,432</td> </tr> </tbody> </table> | | | | | | | | | | | | | Calculator | | | | ISDA Standard Upfront Model (I)* | | | | Cash Settled On | 03/22/17 | Valuation Date | 03/17/17 | Cash Calculated On | 03/22/17 | | | EDD | No | | | Price | 102.12432096 | Spread DV01 | 4,594.04 | Principal | -212,433 | IR DV01 | 51.39 | Accrued (88 Days) | -24,444 | Rec Risk (1%) | 73.38 | Cash Amount | -236,877 | Def Exposure | 6,212,432 |
| Calculator | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ISDA Standard Upfront Model (I)* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cash Settled On | 03/22/17 | Valuation Date | 03/17/17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cash Calculated On | 03/22/17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EDD | No | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Price | 102.12432096 | Spread DV01 | 4,594.04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Principal | -212,433 | IR DV01 | 51.39 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Accrued (88 Days) | -24,444 | Rec Risk (1%) | 73.38 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cash Amount | -236,877 | Def Exposure | 6,212,432 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *This application is based on the ISDA Std Model v1, developed and supported in collaboration with Markit Group Ltd. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2017 Bloomberg F SN 459564 PDT GMT-7:00 H336-723-1 17-Mar-2017 10:59:06 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

PORTFOLIO ANALYSIS AND RISK

- Applying and Aggregating Risk
- Monitoring Sector Concentrations
- Quantifying Impact of Yield Curve Shifts on Value
- Monitoring Current Mark-to-Market

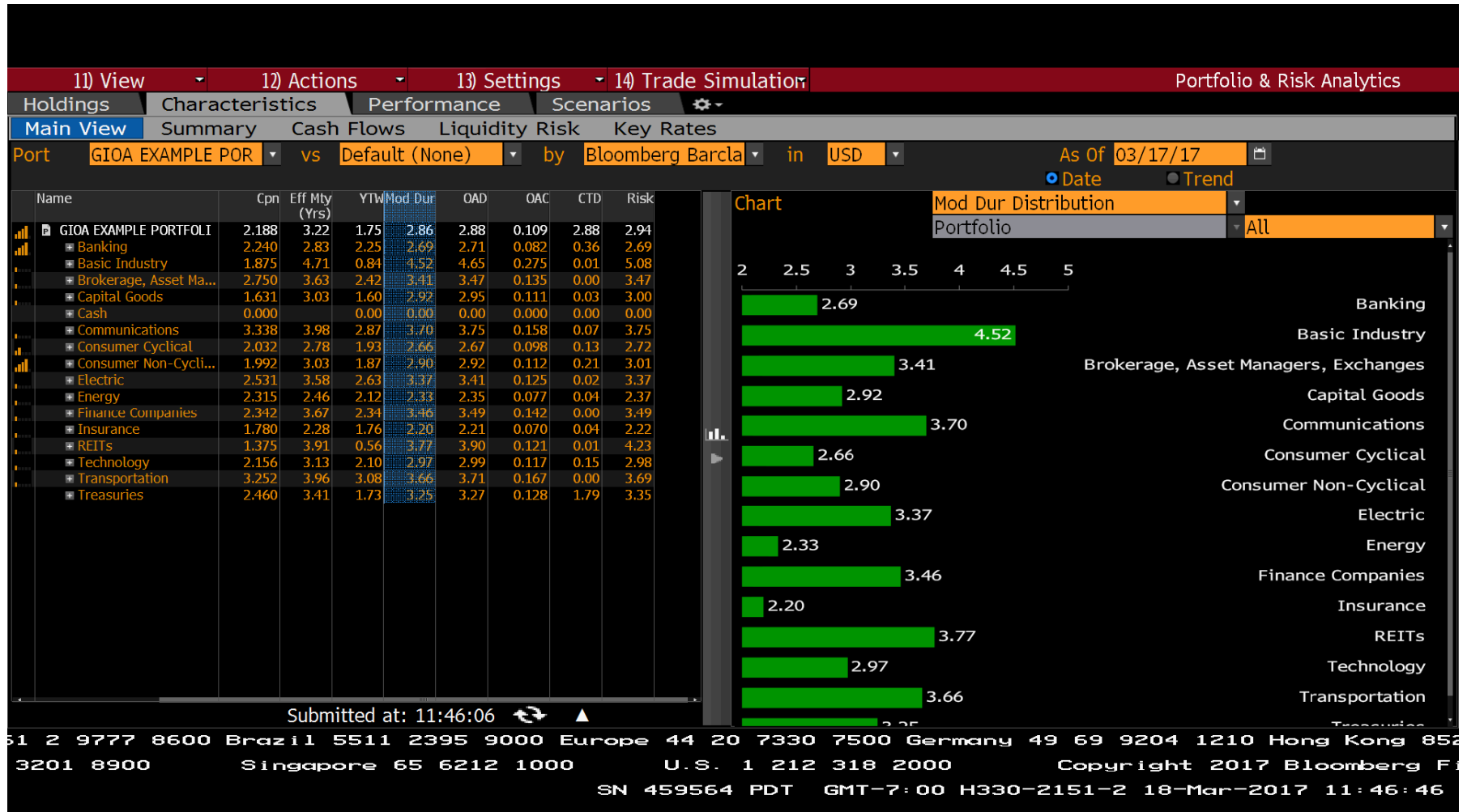
CHARACTERISTICS ANALYSIS:

| 1) View 2) Actions 3) Settings 14) Trade Simulation Portfolio & Risk Analytics | | | | | | | | | | | | | |
|--|--------|-----|-------|---------------|------|---------|------|-------|------|------|--|--|--|
| Holdings Characteristics Performance Scenarios | | | | | | | | | | | | | |
| Main View Summary Cash Flows Liquidity Risk Key Rates | | | | | | | | | | | | | |
| Port: GIOA EXAMPLE POR vs Default (None) by Bloomberg Barcla in USD As Of 03/16/17 | | | | | | | | | | | | | |
| Date Trend | | | | | | | | | | | | | |
| Name | wgt | Pos | Cpn | Eff Mty (Yrs) | YTW | Mod Dur | OAD | OAC | CTD | Risk | | | |
| GIOA EXAMPLE PORTFOLI | 100.00 | | 2.343 | 3.23 | 1.89 | 3.07 | 3.09 | 0.117 | 3.09 | 3.14 | | | |
| Banking | 14.41 | | 2.240 | 2.83 | 2.27 | 2.69 | 2.71 | 0.082 | 0.39 | 2.69 | | | |
| Basic Industry | 0.16 | | 1.875 | 4.71 | 0.84 | 4.52 | 4.66 | 0.250 | 0.01 | 5.08 | | | |
| Brokerage, Asset Ma... | 0.07 | | 2.750 | 3.63 | 2.44 | 3.41 | 3.48 | 0.135 | 0.00 | 3.47 | | | |
| Capital Goods | 1.23 | | 1.631 | 3.03 | 1.61 | 2.92 | 2.96 | 0.112 | 0.04 | 3.00 | | | |
| Communications | 2.01 | | 3.338 | 3.99 | 2.90 | 3.71 | 3.75 | 0.162 | 0.08 | 3.76 | | | |
| Consumer Cyclical | 5.40 | | 2.031 | 2.78 | 1.94 | 2.66 | 2.67 | 0.098 | 0.14 | 2.72 | | | |
| Consumer Non-Cycli... | 7.85 | | 1.992 | 3.03 | 1.88 | 2.90 | 2.92 | 0.111 | 0.23 | 3.01 | | | |
| Electric | 0.57 | | 2.532 | 3.58 | 2.64 | 3.37 | 3.42 | 0.124 | 0.02 | 3.37 | | | |
| Energy | 1.86 | | 2.314 | 2.46 | 2.14 | 2.33 | 2.35 | 0.074 | 0.04 | 2.37 | | | |
| Finance Companies | 0.07 | | 2.342 | 3.67 | 2.35 | 3.46 | 3.49 | 0.142 | 0.00 | 3.49 | | | |
| Insurance | 1.86 | | 1.780 | 2.28 | 1.76 | 2.20 | 2.22 | 0.069 | 0.04 | 2.22 | | | |
| REITs | 0.16 | | 1.375 | 3.92 | 0.55 | 3.78 | 3.90 | 0.141 | 0.01 | 4.23 | | | |
| Technology | 5.49 | | 2.156 | 3.13 | 2.12 | 2.97 | 2.99 | 0.117 | 0.16 | 2.98 | | | |
| Transportation | 0.14 | | 3.252 | 3.96 | 3.08 | 3.66 | 3.71 | 0.167 | 0.01 | 3.69 | | | |
| Treasuries | 58.72 | | 2.460 | 3.42 | 1.74 | 3.25 | 3.27 | 0.128 | 1.92 | 3.35 | | | |

Holdings as of: 3/17/2015 Submitted at: 13:25:41 Zoom +70%

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APPLYING SECURITY ANALYTICS TO A PORTFOLIO



KEY RATE ANALYSIS:

11) View | 12) Actions | 13) Settings | 14) Trade Simulation | Portfolio & Risk Analytics

Holdings | Characteristics | Performance | Scenarios | Key Rates

Main View | Summary | Cash Flows | Liquidity Risk | Key Rates

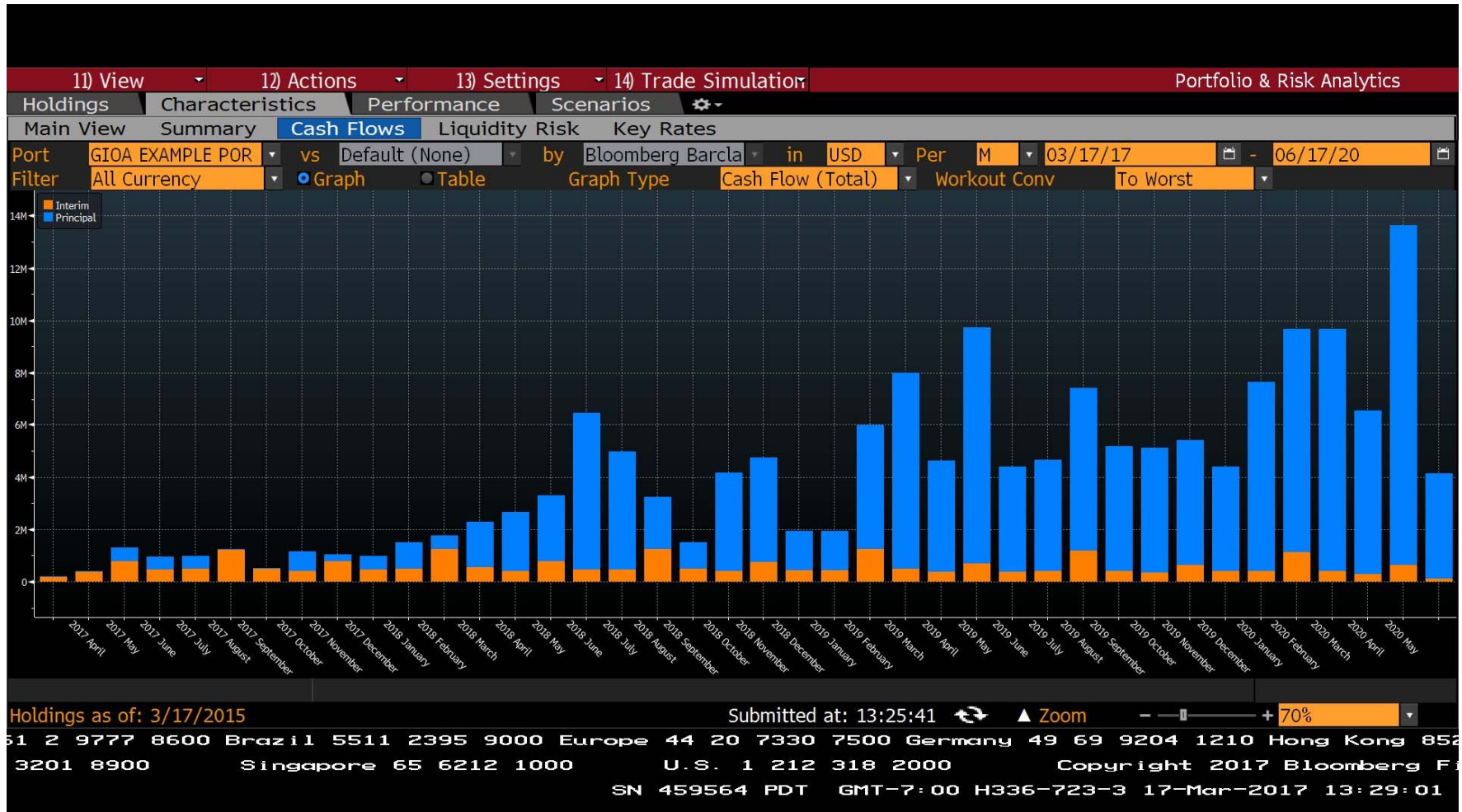
Port: GIOA EXAMPLE POR vs Default (None) by Bloomberg Barcla in USD As Of 03/16/17

GIOA EXAMPLE PORTFOLIO

| Name | DV01 | 6M | 1Y | 2Y | 3Y | 5Y | 7Y | 10Y | 20Y | 30Y |
|--------------------------------------|------------|--------|----------|-----------|-----------|-----------|------|------|------|------|
| Totals | 109,032.98 | 226.53 | 2,771.16 | 11,177.98 | 60,481.06 | 34,374.76 | 0.00 | 0.00 | 0.00 | 0.00 |
| Banking | 13,797.21 | 38.00 | 1,052.52 | 2,514.96 | 5,846.53 | 4,344.17 | 0.00 | 0.00 | 0.00 | 0.00 |
| Basic Industry | 261.99 | 0.06 | 1.12 | 2.31 | 25.89 | 232.71 | 0.00 | 0.00 | 0.00 | 0.00 |
| Brokerage, Asset Managers, Exchanges | 88.58 | 0.10 | 0.21 | 0.47 | 57.98 | 29.81 | 0.00 | 0.00 | 0.00 | 0.00 |
| Capital Goods | 1,283.72 | 3.47 | 64.62 | 221.19 | 486.44 | 507.98 | 0.00 | 0.00 | 0.00 | 0.00 |
| Communications | 2,663.94 | 3.22 | 8.70 | 47.43 | 1,124.94 | 1,479.50 | 0.00 | 0.00 | 0.00 | 0.00 |
| Consumer Cyclical | 5,099.33 | 24.44 | 418.15 | 1,074.73 | 1,770.95 | 1,811.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Consumer Non-Cyclical | 8,101.52 | 44.52 | 440.10 | 926.95 | 3,487.14 | 3,202.80 | 0.00 | 0.00 | 0.00 | 0.00 |
| Electric | 683.33 | 0.64 | 1.35 | 43.38 | 364.49 | 273.44 | 0.00 | 0.00 | 0.00 | 0.00 |
| Energy | 1,548.07 | 15.08 | 209.39 | 315.25 | 569.53 | 438.78 | 0.00 | 0.00 | 0.00 | 0.00 |
| Finance Companies | 87.86 | 0.07 | 0.13 | 0.28 | 58.23 | 29.15 | 0.00 | 0.00 | 0.00 | 0.00 |
| Insurance | 1,451.39 | 20.25 | 189.85 | 319.60 | 627.98 | 293.71 | 0.00 | 0.00 | 0.00 | 0.00 |
| REITs | 218.58 | 0.11 | 0.87 | 1.91 | 105.10 | 110.56 | 0.00 | 0.00 | 0.00 | 0.00 |

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CASH FLOW PROJECTIONS/REPORTS



TRACKING HISTORICAL PERFORMANCE:

| 11) View 12) Actions 13) Settings 14) Trade Simulation Portfolio & Risk Analytics | | | | | | | | | |
|---|-----------|------------|------------|------------|------------|------------|------------|--|--|
| Holdings Characteristics Performance Scenarios | | | | | | | | | |
| Main View Total Return Period Analysis Seasonal Analysis Statistical Summary | | | | | | | | | |
| Port: GIOA EXAMPLE POR vs Default (None) by Bloomberg Barcla in USD As Of 03/16/17 | | | | | | | | | |
| Unit Percentage | | | | | | | | | |
| Name | % End Wgt | Tot Rtn 1W | Tot Rtn 1M | Tot Rtn 2M | Tot Rtn 3M | Tot Rtn 6M | Tot Rtn 1Y | | |
| GIOA EXAMPLE PORTFOLI | 100.00 | 0.28 | -0.09 | 0.11 | 0.84 | -1.27 | 0.64 | | |
| Banking | 14.41 | 0.22 | -0.03 | 0.29 | 1.00 | -0.41 | 2.33 | | |
| Basic Industry | 0.16 | 1.21 | 0.35 | 1.56 | 4.05 | -3.82 | 2.90 | | |
| Brokerage, Asset Ma... | 0.07 | 0.26 | -0.19 | 0.09 | 1.38 | -1.37 | 2.46 | | |
| Capital Goods | 1.23 | 0.44 | 0.03 | 0.41 | 1.47 | -1.91 | 0.59 | | |
| Communications | 2.01 | 0.35 | 0.12 | 0.33 | 1.41 | -1.47 | 1.93 | | |
| Consumer Cyclical | 5.40 | 0.35 | 0.17 | 0.69 | 1.51 | -0.45 | 2.08 | | |
| Consumer Non-Cycli... | 7.85 | 0.41 | 0.04 | 0.54 | 1.31 | -1.15 | 0.82 | | |
| Electric | 0.57 | 0.24 | -0.07 | 0.23 | 1.12 | -1.14 | 3.36 | | |
| Energy | 1.86 | 0.17 | -0.10 | 0.08 | 0.72 | -0.03 | 3.45 | | |
| Finance Companies | 0.07 | 0.30 | -0.20 | 0.40 | 1.35 | -1.47 | -1.90 | | |
| Insurance | 1.86 | 0.23 | 0.00 | 0.24 | 0.93 | -0.80 | 1.13 | | |
| REITs | 0.16 | 1.23 | 0.37 | 1.28 | 3.19 | -3.80 | 1.24 | | |
| Technology | 5.49 | 0.27 | -0.06 | 0.17 | 1.02 | -0.92 | 1.41 | | |
| Transportation | 0.14 | 0.53 | 0.53 | 0.53 | 0.53 | 0.53 | 0.53 | | |
| Treasuries | 58.72 | 0.27 | -0.16 | -0.07 | 0.62 | -1.59 | 0.00 | | |

Holdings as of: Varies by field Submitted at: 13:25:41 ▲ Zoom +70%

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QUANTIFYING IMPACT OF YIELD CURVE SHIFTS

| 1) View 2) Actions 3) Settings 14) Trade Simulation Portfolio & Risk Analytics | | | | | | | | | | | | | | | | | | | |
|---|-----------|------------------|-----------------|-------------|-----|----------------|----------------|----|--|----------|--|----|--|---------|--|----------|--|----------|--|
| Holdings Characteristics Performance Scenarios Attribution Intraday Tracking Error/Volatility VaR | | | | | | | | | | | | | | | | | | | |
| Main View Scenario Summary Best & Worst Scenario Navigator | | | | | | | | | | | | | | | | | | | |
| Port | | GIOA EXAMPLE POR | | vs | | Default (None) | | by | | Duration | | in | | USD | | As of | | 03/15/17 | |
| Scen | | +25 | | | | | | | | | | | | Horizon | | 6 Months | | | |
| Name | P&L (+25) | P&L% (+25) | Stress MV (+25) | Mkt Val | Pos | % Wgt | Duration (+25) | | | | | | | | | | | | |
| GIOA EXAMPLE PORTFOLIO | 2,565,459 | 0.57 | 455,783,872 | 453,218,450 | | 100.00 | 2.75 | | | | | | | | | | | | |
| └ 0 - 1 yrs | 30,824 | 0.51 | 6,046,934 | 6,016,109 | | 1.33 | 0.26 | | | | | | | | | | | | |
| └ 1 - 3 yrs | 762,511 | 0.63 | 121,641,600 | 120,879,090 | | 26.67 | 1.73 | | | | | | | | | | | | |
| └ 3 - 5 yrs | 1,772,123 | 0.54 | 328,095,328 | 326,323,250 | | 72.00 | 3.17 | | | | | | | | | | | | |

Holdings as of: 12/31/2016 (!) 3 Notices Submitted at: 11:54:46 ▲ Zoom - 85%

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QUESTIONS:

- Thank you!