from us, provide a description of the component or group and its position within the corporate or partnership structure, and provide the following certification:

[Name of the bidder] hereby certifies that to the best of its knowledge and belief it meets the criteria for a separate bidder as described in appendix A to 31 CFR part 356. The above-named bidder also certifies that it has established written policies or procedures, including ongoing compliance monitoring processes, that are designed to prevent the component or group of components from:

(1) Exchanging any of the following information with any other part of the corporate [partnership] structure: (a) yields or rates at which it plans to bid; (b) amounts of securities for which it plans to bid; (c) positions that it holds or plans to acquire in a security being auctioned; and (d) investment strategies that it plans to follow regarding the security being auctioned, or

(2) In any way intentionally acting together with any other part of the corporate [partnership] structure with respect to formulating or entering bids in a Treasury auction.

The above-named bidder agrees that it will promptly notify the Department in writing when any of the information provided to obtain separate bidder status changes or when this certification is no longer valid.

[69 FR 45202, July 28, 2004, as amended at 70 FR 29456, May 23, 2005]

## APPENDIX B TO PART 356—FORMULAS AND TABLES

I. Computation of Interest on Treasury Bonds and Notes.

II. Formulas for Conversion of Fixed-Principal Security Yields to Equivalent Prices.

III. Formulas for Conversion of Inflation-Protected Security Yields to Equivalent Prices.

IV. Computation of Adjusted Values and Payment Amounts for Stripped Inflation-Protected Interest Components.

V. Computation of Purchase Price, Discount Rate, and Investment Rate (Coupon-Equivalent Yield) for Treasury Bills.

The examples in this appendix are given for illustrative purposes only and are in no way a prediction of interest rates on any bills, notes, or bonds issued under this part. In some of the following examples, we use intermediate rounding for ease in following the calculations. In actual practice, we generally do not round prior to determining the final result.

If you use a multi-decimal calculator, we recommend setting your calculator to at least 13 decimals and then applying normal rounding procedures. This should be sufficient to obtain the same final results. However, in the case of any discrepancies, our determinations will be final.

### I. COMPUTATION OF INTEREST ON TREASURY BONDS AND NOTES

*A. Treasury Fixed-Principal Securities*

1. *Regular Half-Year Payment Period.* We pay interest on marketable Treasury fixed-principal securities on a semiannual basis. The regular interest payment period is a full half-year of six calendar months. Examples of half-year periods are: (1) February 15 to August 15, (2) May 31 to November 30, and (3) February 29 to August 31 (in a leap year). Calculation of an interest payment for a fixed-principal note with a par amount of $1,000 and an interest rate of 8% is made in this manner: ($1,000 × .08)/2 = $40. Specifically, a semiannual interest payment represents one half of one year's interest, and is computed on this basis regardless of the actual number of days in the half-year.

2. *Daily Interest Decimal.* We compute a daily interest decimal in cases where an interest payment period for a fixed-principal security is shorter or longer than six months or where accrued interest is payable by an investor. We base the daily interest decimal on the actual number of calendar days in the half-year or half-years involved. The number of days in any half-year period is shown in Table 1.

TABLE 1

| Interest period | Beginning and ending days are 1st or 15th of the months listed under interest period (number of days) | | Beginning and ending days are the last days of the months listed under interest period (number of days) | |
|---|---|---|---|---|
| | Regular year | Leap year | Regular year | Leap year |
| January to July | 181 | 182 | 181 | 182 |
| February to August | 181 | 182 | 184 | 184 |
| March to September | 184 | 184 | 183 | 183 |
| April to October | 183 | 183 | 184 | 184 |
| May to November | 184 | 184 | 183 | 183 |
| June to December | 183 | 183 | 184 | 184 |
| July to January | 184 | 184 | 184 | 184 |
| August to February | 184 | 184 | 181 | 182 |
| September to March | 181 | 182 | 182 | 183 |

TABLE 1—Continued

| Interest period | Beginning and ending days are 1st or 15th of the months listed under interest period (number of days) | | Beginning and ending days are the last days of the months listed under interest period (number of days) | |
|---|---|---|---|---|
| | Regular year | Leap year | Regular year | Leap year |
| October to April | 182 | 183 | 181 | 182 |
| November to May | 181 | 182 | 182 | 183 |
| December to June | 182 | 183 | 181 | 182 |

Table 2 below shows the daily interest decimals covering interest from 1⁄8% to 20% on $1,000 for one day in increments of 1⁄8 of one percent. These decimals represent 1⁄181, 1⁄182, 1⁄183, or 1⁄184 of a full semiannual interest payment, depending on which half-year is applicable.

TABLE 2

[Decimal for one day's interest on $1,000 at various rates of interest, payable semiannually or on a semiannual basis, in regular years of 365 days and in years of 366 days (to determine applicable number of days, see table 1.)]

| Rate per annum (percent) | Half-year of 184 days | Half-year of 183 days | Half-year of 182 days | Half-year of 181 days |
|---|---|---|---|---|
| 1⁄8 | 0.003396739 | 0.003415301 | 0.003434066 | 0.003453039 |
| 1⁄4 | 0.006793478 | 0.006830601 | 0.006868132 | 0.006906077 |
| 3⁄8 | 0.010190217 | 0.010245902 | 0.010302198 | 0.010359116 |
| 1⁄2 | 0.013586957 | 0.013661202 | 0.013736264 | 0.013812155 |
| 5⁄8 | 0.016983696 | 0.017076503 | 0.017170330 | 0.017265193 |
| 3⁄4 | 0.020380435 | 0.020491803 | 0.020604396 | 0.020718232 |
| 7⁄8 | 0.023777174 | 0.023907104 | 0.024038462 | 0.024171271 |
| 1 | 0.027173913 | 0.027322404 | 0.027472527 | 0.027624309 |
| 1 1⁄8 | 0.030570652 | 0.030737705 | 0.030906593 | 0.031077348 |
| 1 1⁄4 | 0.033967391 | 0.034153005 | 0.034340659 | 0.034530387 |
| 1 3⁄8 | 0.037364130 | 0.037568306 | 0.037774725 | 0.037983425 |
| 1 1⁄2 | 0.040760870 | 0.040983607 | 0.041208791 | 0.041436464 |
| 1 5⁄8 | 0.044157609 | 0.044398907 | 0.044642857 | 0.044889503 |
| 1 3⁄4 | 0.047554348 | 0.047814208 | 0.048076923 | 0.048342541 |
| 1 7⁄8 | 0.050951087 | 0.051229508 | 0.051510989 | 0.051795580 |
| 2 | 0.054347826 | 0.054644809 | 0.054945055 | 0.055248619 |
| 2 1⁄8 | 0.057744565 | 0.058060109 | 0.058379121 | 0.058701657 |
| 2 1⁄4 | 0.061141304 | 0.061475410 | 0.061813187 | 0.062154696 |
| 2 3⁄8 | 0.064538043 | 0.064890710 | 0.065247253 | 0.065607735 |
| 2 1⁄2 | 0.067934783 | 0.068306011 | 0.068681319 | 0.069060773 |
| 2 5⁄8 | 0.071331522 | 0.071721311 | 0.072115385 | 0.072513812 |
| 2 3⁄4 | 0.074728261 | 0.075136612 | 0.075549451 | 0.075966851 |
| 2 7⁄8 | 0.078125000 | 0.078551913 | 0.078983516 | 0.079419890 |
| 3 | 0.081521739 | 0.081967213 | 0.082417582 | 0.082872928 |
| 3 1⁄8 | 0.084918478 | 0.085382514 | 0.085851648 | 0.086325967 |
| 3 1⁄4 | 0.088315217 | 0.088797814 | 0.089285714 | 0.089779006 |
| 3 3⁄8 | 0.091711957 | 0.092213115 | 0.092719780 | 0.093232044 |
| 3 1⁄2 | 0.095108696 | 0.095628415 | 0.096153846 | 0.096685083 |
| 3 5⁄8 | 0.098505435 | 0.099043716 | 0.099587912 | 0.100138122 |
| 3 3⁄4 | 0.101902174 | 0.102459016 | 0.103021978 | 0.103591160 |
| 3 7⁄8 | 0.105298913 | 0.105874317 | 0.106456044 | 0.107044199 |
| 4 | 0.108695652 | 0.109289617 | 0.109890110 | 0.110497238 |
| 4 1⁄8 | 0.112092391 | 0.112704918 | 0.113324176 | 0.113950276 |
| 4 1⁄4 | 0.115489130 | 0.116120219 | 0.116758242 | 0.117403315 |
| 4 3⁄8 | 0.118885870 | 0.119535519 | 0.120192308 | 0.120856354 |
| 4 1⁄2 | 0.122282609 | 0.122950820 | 0.123626374 | 0.124309392 |
| 4 5⁄8 | 0.125679348 | 0.126366120 | 0.127060440 | 0.127762431 |
| 4 3⁄4 | 0.129076087 | 0.129781421 | 0.130494505 | 0.131215470 |
| 4 7⁄8 | 0.132472826 | 0.133196721 | 0.133928571 | 0.134668508 |
| 5 | 0.135869565 | 0.136612022 | 0.137362637 | 0.138121547 |
| 5 1⁄8 | 0.139266304 | 0.140027322 | 0.140796703 | 0.141574586 |
| 5 1⁄4 | 0.142663043 | 0.143442623 | 0.144230769 | 0.145027624 |
| 5 3⁄8 | 0.146059783 | 0.146857923 | 0.147664835 | 0.148480663 |
| 5 1⁄2 | 0.149456522 | 0.150273224 | 0.151098901 | 0.151933702 |
| 5 5⁄8 | 0.152853261 | 0.153688525 | 0.154532967 | 0.155386740 |
| 5 3⁄4 | 0.156250000 | 0.157103825 | 0.157967033 | 0.158839779 |
| 5 7⁄8 | 0.159646739 | 0.160519126 | 0.161401099 | 0.162292818 |
| 6 | 0.163043478 | 0.163934426 | 0.164835165 | 0.165745856 |
| 6 1⁄8 | 0.166440217 | 0.167349727 | 0.168269231 | 0.169198895 |

TABLE 2—Continued

[Decimal for one day's interest on $1,000 at various rates of interest, payable semiannually or on a semiannual basis, in regular years of 365 days and in years of 366 days (to determine applicable number of days, see table 1.)]

| Rate per annum (percent) | Half-year of 184 days | Half-year of 183 days | Half-year of 182 days | Half-year of 181 days |
|---|---|---|---|---|
| 6¼ | 0.169836957 | 0.170765027 | 0.171703297 | 0.172651934 |
| 6⅜ | 0.173233696 | 0.174180328 | 0.175137363 | 0.176104972 |
| 6½ | 0.176630435 | 0.177595628 | 0.178571429 | 0.179558011 |
| 6⅝ | 0.180027174 | 0.181010929 | 0.182005495 | 0.183011050 |
| 6¾ | 0.183423913 | 0.184426230 | 0.185439560 | 0.186464088 |
| 6⅞ | 0.186820652 | 0.187841530 | 0.188873626 | 0.189917127 |
| 7 | 0.190217391 | 0.191256831 | 0.192307692 | 0.193370166 |
| 7⅛ | 0.193614130 | 0.194672131 | 0.195741758 | 0.196823204 |
| 7¼ | 0.197010870 | 0.198087432 | 0.199175824 | 0.200276243 |
| 7⅜ | 0.200407609 | 0.201502732 | 0.202609890 | 0.203729282 |
| 7½ | 0.203804348 | 0.204918033 | 0.206043956 | 0.207182320 |
| 7⅝ | 0.207201087 | 0.208333333 | 0.209478022 | 0.210635359 |
| 7¾ | 0.210597826 | 0.211748634 | 0.212912088 | 0.214088398 |
| 7⅞ | 0.213994565 | 0.215163934 | 0.216346154 | 0.217541436 |
| 8 | 0.217391304 | 0.218579235 | 0.219780220 | 0.220994475 |
| 8⅛ | 0.220788043 | 0.221994536 | 0.223214286 | 0.224447514 |
| 8¼ | 0.224184783 | 0.225409836 | 0.226648352 | 0.227900552 |
| 8⅜ | 0.227581522 | 0.228825137 | 0.230082418 | 0.231353591 |
| 8½ | 0.230978261 | 0.232240437 | 0.233516484 | 0.234806630 |
| 8⅝ | 0.234375000 | 0.235655738 | 0.236950549 | 0.238259669 |
| 8¾ | 0.237771739 | 0.239071038 | 0.240384615 | 0.241712707 |
| 8⅞ | 0.241168478 | 0.242486339 | 0.243818681 | 0.245165746 |
| 9 | 0.244565217 | 0.245901639 | 0.247252747 | 0.248618785 |
| 9⅛ | 0.247961957 | 0.249316940 | 0.250686813 | 0.252071823 |
| 9¼ | 0.251358696 | 0.252732240 | 0.254120879 | 0.255524862 |
| 9⅜ | 0.254755435 | 0.256147541 | 0.257554945 | 0.258977901 |
| 9½ | 0.258152174 | 0.259562842 | 0.260989011 | 0.262430939 |
| 9⅝ | 0.261548913 | 0.262978142 | 0.264423077 | 0.265883978 |
| 9¾ | 0.264945652 | 0.266393443 | 0.267857143 | 0.269337017 |
| 9⅞ | 0.268342391 | 0.269808743 | 0.271291209 | 0.272790055 |
| 10 | 0.271739130 | 0.273224044 | 0.274725275 | 0.276243094 |
| 10⅛ | 0.275135870 | 0.276639344 | 0.278159341 | 0.279696133 |
| 10¼ | 0.278532609 | 0.280054645 | 0.281593407 | 0.283149171 |
| 10⅜ | 0.281929348 | 0.283469945 | 0.285027473 | 0.286602210 |
| 10½ | 0.285326087 | 0.286885246 | 0.288461538 | 0.290055249 |
| 10⅝ | 0.288722826 | 0.290300546 | 0.291895604 | 0.293508287 |
| 10¾ | 0.292119565 | 0.293715847 | 0.295329670 | 0.296961326 |
| 10⅞ | 0.295516304 | 0.297131148 | 0.298763736 | 0.300414365 |
| 11 | 0.298913043 | 0.300546448 | 0.302197802 | 0.303867403 |
| 11⅛ | 0.302309783 | 0.303961749 | 0.305631868 | 0.307320442 |
| 11¼ | 0.305706522 | 0.307377049 | 0.309065934 | 0.310773481 |
| 11⅜ | 0.309103261 | 0.310792350 | 0.312500000 | 0.314226519 |
| 11½ | 0.312500000 | 0.314207650 | 0.315934066 | 0.317679558 |
| 11⅝ | 0.315896739 | 0.317622951 | 0.319368132 | 0.321132597 |
| 11¾ | 0.319293478 | 0.321038251 | 0.322802198 | 0.324585635 |
| 11⅞ | 0.322690217 | 0.324453552 | 0.326236264 | 0.328038674 |
| 12 | 0.326086957 | 0.327868852 | 0.329670330 | 0.331491713 |
| 12⅛ | 0.329483696 | 0.331284153 | 0.333104396 | 0.334944751 |
| 12¼ | 0.332880435 | 0.334699454 | 0.336538462 | 0.338397790 |
| 12⅜ | 0.336277174 | 0.338114754 | 0.339972527 | 0.341850829 |
| 12½ | 0.339673913 | 0.341530055 | 0.343406593 | 0.345303867 |
| 12⅝ | 0.343070652 | 0.344945355 | 0.346840659 | 0.348756906 |
| 12¾ | 0.346467391 | 0.348360656 | 0.350274725 | 0.352209945 |
| 12⅞ | 0.349864130 | 0.351775956 | 0.353708791 | 0.355662983 |
| 13 | 0.353260870 | 0.355191257 | 0.357142857 | 0.359116022 |
| 13⅛ | 0.356657609 | 0.358606557 | 0.360576923 | 0.362569061 |
| 13¼ | 0.360054348 | 0.362021858 | 0.364010989 | 0.366022099 |
| 13⅜ | 0.363451087 | 0.365437158 | 0.367445055 | 0.369475138 |
| 13½ | 0.366847826 | 0.368852459 | 0.370879121 | 0.372928177 |
| 13⅝ | 0.370244565 | 0.372267760 | 0.374313187 | 0.376381215 |
| 13¾ | 0.373641304 | 0.375683060 | 0.377747253 | 0.379834254 |
| 13⅞ | 0.377038043 | 0.379098361 | 0.381181319 | 0.383287293 |
| 14 | 0.380434783 | 0.382513661 | 0.384615385 | 0.386740331 |
| 14⅛ | 0.383831522 | 0.385928962 | 0.388049451 | 0.390193370 |
| 14¼ | 0.387228261 | 0.389344262 | 0.391483516 | 0.393646409 |
| 14⅜ | 0.390625000 | 0.392759563 | 0.394917582 | 0.397099448 |
| 14½ | 0.394021739 | 0.396174863 | 0.398351648 | 0.400552486 |
| 14⅝ | 0.397418478 | 0.399590164 | 0.401785714 | 0.404005525 |
| 14¾ | 0.400815217 | 0.403005464 | 0.405219780 | 0.407458564 |

TABLE 2—Continued

[Decimal for one day's interest on $1,000 at various rates of interest, payable semiannually or on a semiannual basis, in regular years of 365 days and in years of 366 days (to determine applicable number of days, see table 1.)]

| Rate per annum (percent) | Half-year of 184 days | Half-year of 183 days | Half-year of 182 days | Half-year of 181 days |
|---|---|---|---|---|
| 14⅞ | 0.404211957 | 0.406420765 | 0.408653846 | 0.410911602 |
| 15 | 0.407608696 | 0.409836066 | 0.412087912 | 0.414364641 |
| 15⅛ | 0.411005435 | 0.413251366 | 0.415521978 | 0.417817680 |
| 15¼ | 0.414402174 | 0.416666667 | 0.418956044 | 0.421270718 |
| 15⅜ | 0.417798913 | 0.420081967 | 0.422390110 | 0.424723757 |
| 15½ | 0.421195652 | 0.423497268 | 0.425824176 | 0.428176796 |
| 15⅝ | 0.424592391 | 0.426912568 | 0.429258242 | 0.431629834 |
| 15¾ | 0.427989130 | 0.430327869 | 0.432692308 | 0.435082873 |
| 15⅞ | 0.431385870 | 0.433743169 | 0.436126374 | 0.438535912 |
| 16 | 0.434782609 | 0.437158470 | 0.439560440 | 0.441988950 |
| 16⅛ | 0.438179348 | 0.440573770 | 0.442994505 | 0.445441989 |
| 16¼ | 0.441576087 | 0.443989071 | 0.446428571 | 0.448895028 |
| 16⅜ | 0.444972826 | 0.447404372 | 0.449862637 | 0.452348066 |
| 16½ | 0.448369565 | 0.450819672 | 0.453296703 | 0.455801105 |
| 16⅝ | 0.451766304 | 0.454234973 | 0.456730769 | 0.459254144 |
| 16¾ | 0.455163043 | 0.457650273 | 0.460164835 | 0.462707182 |
| 16⅞ | 0.458559783 | 0.461065574 | 0.463598901 | 0.466160221 |
| 17 | 0.461956522 | 0.464480874 | 0.467032967 | 0.469613260 |
| 17⅛ | 0.465353261 | 0.467896175 | 0.470467033 | 0.473066298 |
| 17¼ | 0.468750000 | 0.471311475 | 0.473901099 | 0.476519337 |
| 17⅜ | 0.472146739 | 0.474726776 | 0.477335165 | 0.479972376 |
| 17½ | 0.475543478 | 0.478142077 | 0.480769231 | 0.483425414 |
| 17⅝ | 0.478940217 | 0.481557377 | 0.484203297 | 0.486878453 |
| 17¾ | 0.482336957 | 0.484972678 | 0.487637363 | 0.490331492 |
| 17⅞ | 0.485733696 | 0.488387978 | 0.491071429 | 0.493784530 |
| 18 | 0.489130435 | 0.491803279 | 0.494505495 | 0.497237569 |
| 18⅛ | 0.492527174 | 0.495218579 | 0.497939560 | 0.500690608 |
| 18¼ | 0.495923913 | 0.498633880 | 0.501373626 | 0.504143646 |
| 18⅜ | 0.499320652 | 0.502049180 | 0.504807692 | 0.507596685 |
| 18½ | 0.502717391 | 0.505464481 | 0.508241758 | 0.511049724 |
| 18⅝ | 0.506114130 | 0.508879781 | 0.511675824 | 0.514502762 |
| 18¾ | 0.509510870 | 0.512295082 | 0.515109890 | 0.517955801 |
| 18⅞ | 0.512907609 | 0.515710383 | 0.518543956 | 0.521408840 |
| 19 | 0.516304348 | 0.519125683 | 0.521978022 | 0.524861878 |
| 19⅛ | 0.519701087 | 0.522540984 | 0.525412088 | 0.528314917 |
| 19¼ | 0.523097826 | 0.525956284 | 0.528846154 | 0.531767956 |
| 19⅜ | 0.526494565 | 0.529371585 | 0.532280220 | 0.535220994 |
| 19½ | 0.529891304 | 0.532786885 | 0.535714286 | 0.538674033 |
| 19⅝ | 0.533288043 | 0.536202186 | 0.539148352 | 0.542127072 |
| 19¾ | 0.536684783 | 0.539617486 | 0.542582418 | 0.545580110 |
| 19⅞ | 0.540081522 | 0.543032787 | 0.546016484 | 0.549033149 |
| 20 | 0.543478261 | 0.546448087 | 0.549450549 | 0.552486188 |

3. *Short First Payment Period*. In cases where the first interest payment period for a Treasury fixed-principal security covers less than a full half-year period (a ''short coupon''), we multiply the daily interest decimal by the number of days from, but not including, the issue date to, and including, the first interest payment date. This calculation results in the amount of the interest payable per $1,000 par amount. In cases where the par amount of securities is a multiple of $1,000, we multiply the appropriate multiple by the unrounded interest payment amount per $1,000 par amount.

Example

A 2-year note paying 8⅜% interest was issued on July 2, 1990, with the first interest payment on December 31, 1990. The number of days in the full half-year period of June 30 to December 31, 1990, was 184 (See Table 1.). The number of days for which interest actually accrued was 182 (not including July 2, but including December 31). The daily interest decimal, $0.227581522 (See Table 2, line for 8⅜%, under the column for half-year of 184 days.), was multiplied by 182, resulting in a payment of $41.419837004 per $1,000. For $20,000 of these notes, $41.419837004 would be multiplied by 20, resulting in a payment of $828.39674008 ($828.40).

4. *Long First Payment Period*. In cases where the first interest payment period for a bond or note covers more than a full half-year period (a ''long coupon''), we multiply the daily interest decimal by the number of days from, but not including, the issue date to, and including, the last day of the fractional period that ends one full half-year before the interest payment date. We add that amount to

the regular interest amount for the full half-year ending on the first interest payment date, resulting in the amount of interest payable for $1,000 par amount. In cases where the par amount of securities is a multiple of $1,000, the appropriate multiple should be applied to the unrounded interest payment amount per $1,000 par amount.

Example

A 5-year 2-month note paying 7⅞% interest was issued on December 3, 1990, with the first interest payment due on August 15, 1991. Interest for the regular half-year portion of the payment was computed to be $39.375 per $1,000 par amount. The fractional portion of the payment, from December 3 to February 15, fell in a 184-day half-year (August 15, 1990, to February 15, 1991). Accordingly, the daily interest decimal for 7⅞% was $0.213994565. This decimal, multiplied by 74 (the number of days from but not including December 3, 1990, to and including February 15), resulted in interest for the fractional portion of $15.835597810. When added to $39.375 (the normal interest payment portion ending on August 15, 1991), this produced a first interest payment of $55.210597810, or $55.21 per $1,000 par amount. For $7,000 par amount of these notes, $55.210597810 would be multiplied by 7, resulting in an interest payment of $386.474184670 ($386.47).

*B. Treasury Inflation-Protected Securities*

1. *Indexing Process.* We pay interest on marketable Treasury inflation-protected securities on a semiannual basis. We issue inflation-protected securities with a stated rate of interest that remains constant until maturity. Interest payments are based on the security's inflation-adjusted principal at the time we pay interest. We make this adjustment by multiplying the par amount of the security by the applicable Index Ratio.

2. *Index Ratio.* The numerator of the Index Ratio, the Ref $CPI_{Date}$, is the index number applicable for a specific day. The denominator of the Index Ratio is the Ref CPI applicable for the original issue date. However, when the dated date is different from the original issue date, the denominator is the Ref CPI applicable for the dated date. The formula for calculating the Index Ratio is:

$$\text{Index Ratio}_{\text{Date}} = \frac{\text{Ref CPI}_{\text{Date}}}{\text{Ref CPI}_{\text{Issue Date}}}$$

Where Date = valuation date

3. *Reference CPI.* The Ref CPI for the first day of any calendar month is the CPI for the third preceding calendar month. For example, the Ref CPI applicable to April 1 in any year is the CPI for January, which is reported in February. We determine the Ref CPI for any other day of a month by a linear interpolation between the Ref CPI applicable to the first day of the month in which the day falls (in the example, January) and the Ref CPI applicable to the first day of the next month (in the example, February). For interpolation purposes, we truncate calculations with regard to the Ref CPI and the Index Ratio for a specific date to six decimal places, and round to five decimal places.

Therefore the Ref CPI and the Index Ratio for a particular date will be expressed to five decimal places.

(i) The formula for the Ref CPI for a specific date is:

$$\text{Ref CPI}_{\text{Date}} = \text{Ref CPI}_{\text{M}} + \frac{t-1}{D}\left[\text{Ref CPI}_{\text{M+1}} - \text{Ref CPI}_{\text{M}}\right]$$

Where Date = valuation date

D = the number of days in the month in which Date falls

t = the calendar day corresponding to Date

$CPI_M$ = CPI reported for the calendar month M by the Bureau of Labor Statistics

Ref $CPI_M$ = Ref CPI for the first day of the calendar month in which Date falls, e.g., Ref $CPI_{April1}$ is the $CPI_{January}$

Ref $CPI_{M+1}$ = Ref CPI for the first day of the calendar month immediately following Date

(ii) For example, the Ref CPI for April 15, 1996 is calculated as follows:

$$\text{Ref CPI}_{\text{April 15, 1996}} = \text{Ref CPI}_{\text{April 1, 1996}} + \frac{14}{30}\left[\text{Ref CPI}_{\text{May 1, 1996}} - \text{Ref CPI}_{\text{April 1, 1996}}\right]$$

where D = 30, t = 15

Ref $CPI_{April\ 1,\ 1996}$ = 154.40, the non-seasonally adjusted CPI-U for January 1996.

Ref $CPI_{May\ 1,\ 1996}$ = 154.90, the non-seasonally adjusted CPI-U for February 1996.

(iii) Putting these values in the equation in paragraph (ii) above:

$$\text{Ref CPI}_{\text{April 15, 1996}} = 154.40 + \frac{14}{30}[154.90 - 154.40]$$

$$\text{Ref CPI}_{\text{April 15, 1996}} = 154.633333333$$

This value truncated to six decimals is 154.633333; rounded to five decimals it is 154.63333.

(iv) To calculate the Index Ratio for April 16, 1996, for an inflation-protected security issued on April 15, 1996, the Ref $CPI_{April\ 16,\ 1996}$ must first be calculated. Using the same values in the equation above except that t=16, the Ref $CPI_{April\ 16,\ 1996}$ is 154.65000.

The Index Ratio for April 16, 1996 is:

Index $Ratio_{April\ 16,\ 1996}$ = 154.65000/154.63333 = 1.000107803.

This value truncated to six decimals is 1.000107; rounded to five decimals it is 1.00011.

4. *Index Contingencies.*

(i) If a previously reported CPI is revised, we will continue to use the previously reported (unrevised) CPI in calculating the principal value and interest payments.

If the CPI is rebased to a different year, we will continue to use the CPI based on the base reference period in effect when the security was first issued, as long as that CPI continues to be published.

(ii) We will replace the CPI with an appropriate alternative index if, while an inflation-protected security is outstanding, the applicable CPI is:

• Discontinued,

• In the judgment of the Secretary, fundamentally altered in a manner materially adverse to the interests of an investor in the security, or

• In the judgment of the Secretary, altered by legislation or Executive Order in a manner materially adverse to the interests of an investor in the security.

(iii) If we decide to substitute an alternative index we will consult with the Bureau of Labor Statistics or any successor agency. We will then notify the public of the substitute index and how we will apply it. Determinations of the Secretary in this regard will be final.

(iv) If the CPI for a particular month is not reported by the last day of the following month, we will announce an index number based on the last available twelve-month change in the CPI. We will base our calculations of our payment obligations that rely on that month's CPI on the index number we announce.

(a) For example, if the CPI for month M is not reported timely, the formula for calculating the index number to be used is:

$$CPI_M = CPI_{M-1} \times \left[\frac{CPI_{M-1}}{CPI_{M-13}}\right]^{1/12}$$

(b) Generalizing for the last reported CPI issued N months prior to month M:

$$CPI_M = CPI_{M-N} \times \left[\frac{CPI_{M-N}}{CPI_{M-N-12}}\right]^{N/12}$$

(c) If it is necessary to use these formulas to calculate an index number, we will use that number for all subsequent calculations that rely on the month's index number. We will not replace it with the actual CPI when it is reported, except for use in the above formulas. If it becomes necessary to use the above formulas to derive an index number, we will use the last CPI that has been reported to calculate CPI numbers for months for which the CPI has not been reported timely.

5. *Computation of Interest for a Regular Half-Year Payment Period.* Interest on marketable Treasury inflation-protected securities is payable on a semiannual basis. The regular interest payment period is a full half-year or six calendar months. Examples of half-year periods are January 15 to July 15, and April 15 to October 15. An interest payment will be a fixed percentage of the value of the inflation-adjusted principal, in current dollars, for the date on which it is paid. We will calculate interest payments by multiplying one-half of the specified annual interest rate for the inflation-protected securities by the inflation-adjusted principal for the interest payment date.

Specifically, we compute a semiannual interest payment on the basis of one-half of one year's interest regardless of the actual number of days in the half-year.

Example

A 10-year inflation-protected note paying 3⅞% interest was issued on January 15, 1999, with the first interest payment on July 15,

1999. The Ref CPI on January 15, 1999 (Ref $CPI_{IssueDate}$) was 164, and the Ref CPI on July 15, 1999 (Ref $CPI_{Date}$) was 166.2. For a par amount of $100,000, the inflation-adjusted principal on July 15, 1999, was (166.2/164) × $100,000, or $101,341. This amount was multiplied by .03875/2, or .019375, resulting in a payment of $1,963.48.

*C. Accrued Interest*

1. You will have to pay accrued interest on a Treasury bond or note when interest accrues prior to the issue date of the security. Because you receive a full interest payment despite having held the security for only a portion of the interest payment period, you must compensate us through the payment of accrued interest at settlement.

2. For a Treasury fixed-principal security, if accrued interest covers a fractional portion of a full half-year period, the number of days in the full half-year period and the stated interest rate will determine the daily interest decimal to use in computing the accrued interest. We multiply the decimal by the number of days for which interest has accrued.

3. If a reopened bond or note has a long first interest payment period (a ''long coupon''), and the dated date for the reopened issue is less than six full months before the first interest payment, the accrued interest will fall into two separate half-year periods. A separate daily interest decimal must be multiplied by the respective number of days in each half-year period during which interest has accrued.

4. We round all accrued interest computations to five decimal places for a $1,000 par amount, using normal rounding procedures. We calculate accrued interest for a par amount of securities greater than $1,000 by applying the appropriate multiple to accrued interest payable for a $1,000 par amount, rounded to five decimal places. We calculate accrued interest for a par amount of securities less than $1,000 by applying the appropriate fraction to accrued interest payable for a $1,000 par amount, rounded to five decimal places.

5. For an inflation-protected security, we calculate accrued interest as shown in section III, paragraphs A and B of this appendix.

*Examples*—(1) *Treasury Fixed-Principal Securities—(i) Involving One Half-Year:* A note paying interest at a rate of 6¾%, originally issued on May 15, 2000, as a 5-year note with a first interest payment date of November 15, 2000, was reopened as a 4-year 9-month note on August 15, 2000. Interest had accrued for 92 days, from May 15 to August 15. The regular interest period from May 15 to November 15, 2000, covered 184 days. Accordingly, the daily interest decimal, $0.183423913, multiplied by 92, resulted in accrued interest payable of $16.874999996, or $16.87500, for each $1,000 note purchased. If the notes have a par amount of $150,000, then 150 is multiplied by $16.87500, resulting in an amount payable of $2,531.25.

(2) *Involving Two Half-Years:*

A 10¾% bond, originally issued on July 2, 1985, as a 20-year 1-month bond, with a first interest payment date of February 15, 1986, was reopened as a 19-year 10-month bond on November 4, 1985. Interest had accrued for 44 days, from July 2 to August 15, 1985, during a 181-day half-year (February 15 to August 15); and for 81 days, from August 15 to November 4, during a 184-day half-year (August 15, 1985, to February 15, 1986). Accordingly, $0.296961326 was multiplied by 44, and $0.292119565 was multiplied by 81, resulting in products of $13.066298344 and $23.661684765 which, added together, resulted in accrued interest payable of $36.727983109, or $36.72798, for each $1,000 bond purchased. If the bonds have a par amount of $11,000, then 11 is multiplied by $36.72798, resulting in an amount payable of $404.00778 ($404.01).

## II. Formulas for Conversion of Fixed-Principal Security Yields to Equivalent Prices

*Definitions*

P = price per 100 (dollars), rounded to six places, using normal rounding procedures.

C = the regular annual interest per $100, payable semiannually, e.g., 6.125 (the decimal equivalent of a 6⅛% interest rate).

i = nominal annual rate of return or yield to maturity, based on semiannual interest payments and expressed in decimals, e.g., .0719.

n = number of full semiannual periods from the issue date to maturity, except that, if the issue date is a coupon frequency date, n will be one less than the number of full semiannual periods remaining to maturity. Coupon frequency dates are the two semiannual dates based on the maturity date of each note or bond issue. For example, a security maturing on November 15, 2015, would have coupon frequency dates of May 15 and November 15.

r = (1) number of days from the issue date to the first interest payment (regular or short first payment period), or (2) number of days in fractional portion (or ''initial short period'') of long first payment period.

s = (1) number of days in the full semiannual period ending on the first interest payment date (regular or short first payment period), or (2) number of days in the full semiannual period in which the fractional portion of a long first payment period falls, ending at the onset of the regular portion of the first interest payment.

$v^n = 1 / [1 + (i/2)]^n$ = present value of 1 due at the end of n periods.

$a_n = (1 - v^n) / (i/2) = v + v^2 + v^3 + \ldots + v^n$ = present value of 1 per period for n periods

*Special Case:* If i = 0, then $a_{\overline{n}|}$ = n. Furthermore, when i = 0, $a_{\overline{n}|}$ cannot be calculated using the formula: $(1 - v^n)/(i/2)$. In the special case where i = 0, $a_{\overline{n}|}$ must be calculated as the summation of the individual present values (i.e., $v + v^2 + v^3 + ... + v^n$). Using the summation method will always confirm that $a_{\overline{n}|}$ = n when i = 0.

A = accrued interest.

A. *For fixed-principal securities with a regular first interest payment period:*

Formula:

$P[1 + (r/s)(i/2)] = (C/2)(r/s) + (C/2)a_{\overline{n}|} + 100v^n$.

Example:

For an 8¾% 30-year bond issued May 15, 1990, due May 15, 2020, with interest payments on November 15 and May 15, solve for the price per 100 (P) at a yield of 8.84%.

Definitions:

C = 8.75.
i = .0884.
r = 184 (May 15 to November 15, 1990).
s = 184 (May 15 to November 15, 1990).
n = 59 (There are 60 full semiannual periods, but n is reduced by 1 because the issue date is a coupon frequency date.)
$v^n = 1 / [(1 + .0884 / 2)]^{59}$, or .0779403508.
$a_{\overline{n}|}$ = (1 − .0779403508) / .0442, or 20.8610780353.

Resolution:

$P[1 + (r/s)(i/2)] = (C/2)(r/s) + (C/2)a_{\overline{n}|} + 100v^n$ or
P[1 + (184/184)(.0884/2)] = (8.75/2)(184/184) + (8.75/2)(20.8610780353) + 100(.0779403508).
(1) P[1 + .0442] = 4.375 + 91.2672164044 + 7.7940350840.
(2) P[1.0442] = 103.4362514884.
(3) P = 103.4362514884 / 1.0442.
(4) P = 99.057893.

B. *For fixed-principal securities with a short first interest payment period:*

Formula:

$P[1 + (r/s)(i/2)] = (C/2)(r/s) + (C/2)a_{\overline{n}|} + 100v^n$.

Example:

For an 8½% 2-year note issued April 2, 1990, due March 31, 1992, with interest payments on September 30 and March 31, solve for the price per 100 (P) at a yield of 8.59%.

Definitions:

C = 8.50.
i = .0859.
n = 3.
r = 181 (April 2 to September 30, 1990).
s = 183 (March 31 to September 30, 1990).
$v^n = 1 / [(1 + .0859 / 2)]^3$, or .8814740565.
$a_{\overline{n}|}$ = (1 − .8814740565) / .04295, or 2.7596261590.

Resolution:

$P[1 + (r/s)(i/2)] = (C/2)(r/s) + (C/2)a_{\overline{n}|} + 100v^n$ or
P[1 + (181/183)(.0859/2)] = (8.50/2)(181/183) + (8.50/2)(2.7596261590) + 100(.8814740565).
(1) P[1 + .042480601] = 4.2035519126 + 11.7284111757 + 88.14740565.
(2) P[1.042480601] = 104.0793687354.
(3) P = 104.0793687354 / 1.042480601.
(4) P = 99.838183.

C. *For fixed-principal securities with a long first interest payment period:*

Formula:

$P[1 + (r/s)(i/2)] = [(C/2)(r/s)]v + (C/2)a_{\overline{n}|} + 100v^n$.

Example:

For an 8½% 5-year 2-month note issued March 1, 1990, due May 15, 1995, with interest payments on November 15 and May 15 (first payment on November 15, 1990), solve for the price per 100 (P) at a yield of 8.53%.

Definitions:

C = 8.50.
i = .0853.
n = 10.
r = 75 (March 1 to May 15, 1990, which is the fractional portion of the first interest payment).
s = 181 (November 15, 1989, to May 15, 1990).
v = 1 / (1 + .0853/2), or .9590946147.
$v^n = 1 / (1+.0853/2)^{10}$, or .658589
$a_{\overline{n}|}$ = (1−.658589)/.04265, or 8.0049454082.

Resolution:

$P[1 + (r/s)(i/2)] = [(C/2)(r/s)]v + (C/2)a_{\overline{n}|} + 100v^n$ or
P[1 + (75/181)(.0853/2)] = [(8.50/2)(75/181)].9590946147 + (8.50/2)(8.0049454082) + 100(.6585890783).
(1) P[1 + .017672652] = 1.6890133062 + 34.0210179850 + 65.8589078339.
(2) P[1.017672652] = 101.5689391251.
(3) P = 101.5689391251 / 1.017672652.
(4) P = 99.805118.

D. (1) *For fixed-principal securities reopened during a regular interest period where the purchase price includes predetermined accrued interest.*

(2) *For new fixed-principal securities accruing interest from the coupon frequency date immediately preceding the issue date, with the interest rate established in the auction being used to determine the accrued interest payable on the issue date.*

Formula:

$(P + A)[1 + (r/s)(i/2)] = C/2 + (C/2)a_{\overline{n}|} + 100v^n$.
Where:

A = [(s−r)/s](C/2).

Example:

For a 9½% 10-year note with interest accruing from November 15, 1985, issued November 29, 1985, due November 15, 1995, and interest payments on May 15 and November 15, solve for the price per 100 (P) at a yield of 9.54%. Accrued interest is from November 15 to November 29 (14 days).

Definitions:

C = 9.50.
i = .0954.
n = 19.
r = 167 (November 29, 1985, to May 15, 1986).
s = 181 (November 15, 1985, to May 15, 1986).
$v^n = 1 / [(1 + .0954/2)]^{19}$, or .4125703996.

$a_{n}\rceil = (1 - .4125703996) / .0477$, or 12.3150859630.

$A = [(181 - 167) / 181](9.50/2)$, or .367403.

Resolution:

$(P+A)[1 + (r/s)(i/2)] = C/2 + (C/2)a_{n}\rceil + 100v^{n}$ or

$(P + .367403)[1 + (167/181)(.0954/2)] = (9.50/2) + (9.50/2)(12.3150859630) + 100(.4125703996)$.

(1) $(P + .367403)[1 + .044010497] = 4.75 + 58.4966583243 + 41.25703996$.

(2) $(P + .367403)[1.044010497] = 104.5036982843$.

(3) $(P + .367403) = 104.5036982843 / 1.044010497$.

(4) $(P + .367403) = 100.098321$.

(5) $P = 100.098321 - .367403$.

(6) $P = 99.730918$.

E. *For fixed-principal securities reopened during the regular portion of a long first payment period:*

Formula:

$(P + A)[1 + (r/s)(i/2)] = (r'/s'')(C/2) + C/2 + (C/2)a_{n}\rceil + 100v^{n}$.

Where:

$A = AI' + AI$,

$AI' = (r'/s'')(C/2)$,

$AI = [(s-r) / s](C/2)$, and

r = number of days from the reopening date to the first interest payment date,

s = number of days in the semiannual period for the regular portion of the first interest payment period,

r′ = number of days in the fractional portion (or ''initial short period'') of the first interest payment period,

s″ = number of days in the semiannual period ending with the commencement date of the regular portion of the first interest payment period.

Example:

A 10¾% 19-year 9-month bond due August 15, 2005, is issued on July 2, 1985, and reopened on November 4, 1985, with interest payments on February 15 and August 15 (first payment on February 15, 1986), solve for the price per 100 (P) at a yield of 10.47%. Accrued interest is calculated from July 2 to November 4.

Definitions:

C = 10.75.

i = .1047.

n = 39.

r = 103 (November 4, 1985, to February 15, 1986).

s = 184 (August 15, 1985, to February 15, 1986).

r′ = 44 (July 2 to August 15, 1985).

s″ = 181 (February 15 to August 15, 1985).

$v^{n} = 1 / [(1 + .1047 / 2)]^{39}$, or .1366947986.

$a_{n}\rceil = (1 - .1366947986) / .05235$, or 16.4910258142.

$AI' = (44 / 181)(10.75 / 2)$, or 1.306630.

$AI = [(184 - 103) / 184](10.75 / 2)$, or 2.366168.

$A = AI' + AI$, or 3.672798.

Resolution:

$(P + A)[1 + (r/s)(i/2)] = (r'/s'')(C/2) + C/2 + (C/2)a_{n}\rceil + 100v^{n}$ or

$(P + 3.672798)[1 + (103/184)(.1047/2)] = (44/181)(10.75/2) + 10.75/2 + (10.75/2)(16.4910258142) + 100(.1366947986)$.

(1) $(P + 3.672798)[1 + .02930462] = 1.3066298343 + 5.375 + 88.6392637512 + 13.6694798628$.

(2) $(P + 3.672798)[1.02930462] = 108.9903734482$.

(3) $(P + 3.672798) = 108.9903734482 / 1.02930462$.

(4) $(P + 3.672798) = 105.887384$.

(5) $P = 105.887384 - 3.672798$.

(6) $P = 102.214586$.

F. *For fixed-principal securities reopened during a short first payment period:*

Formula:

$(P + A)[1 + (r/s)(i/2)] = (r'/s)(C/2) + (C/2)a_{n}\rceil + 100v^{n}$.

Where:

$A = [(r' - r)/s](C/2)$ and

r′ = number of days from the original issue date to the first interest payment date.

Example:

For a 10½% 8-year note due May 15, 1991, originally issued on May 16, 1983, and reopened on August 15, 1983, with interest payments on November 15 and May 15 (first payment on November 15, 1983), solve for the price per 100 (P) at a yield of 10.53%. Accrued interest is calculated from May 16 to August 15.

Definitions:

C = 10.50.

i = .1053.

n = 15.

r = 92 (August 15, 1983, to November 15, 1983).

s = 184 (May 15, 1983, to November 15, 1983).

r′ = 183 (May 16, 1983, to November 15, 1983).

$v^{n} = 1/[(1 + .1053/2)]^{15}$, or .4631696332.

$a_{n}\rceil = (1 - .4631696332) / .05265$, or 10.1962082956.

$A = [(183 - 92) / 184](10.50 / 2)$, or 2.596467.

Resolution:

$(P + A)[1 + (r/s)(i/2)] = (r'/s)(C/2) + (C/2)a_{n}\rceil + 100v^{n}$ or

$(P + 2.596467)[1+(92/184)(.1053/2)] = (183/184)(10.50/2) + (10.50/2)(10.1962082956) + 100(.4631696332)$.

(1) $(P + 2.596467)[1 + .026325] = 5.2214673913 + 53.5300935520 + 46.31696332$.

(2) $(P + 2.596467)[1.026325] = 105.0685242633$.

(3) $(P + 2.596467) = 105.0685242633 / 1.026325$.

(4) $(P + 2.596467) = 102.373541$.

(5) $P = 102.373541 - 2.596467$.

(6) $P = 99.777074$.

G. *For fixed-principal securities reopened during the fractional portion (initial short period) of a long first payment period:*

Formula:

$(P + A)[1 + (r/s)(i/2)] = [(r'/s)(C/2)]v + (C/2)a_{n}\rceil + 100v^{n}$.

Where:

$A = [(r' - r)/s](C/2)$, and

r = number of days from the reopening date to the end of the short period.

r′ = number of days in the short period.

s = number of days in the semiannual period ending with the end of the short period.

Example:

For a 9¾% 6-year 2-month note due December 15, 1994, originally issued on October 15, 1988, and reopened on November 15, 1988, with interest payments on June 15 and December 15 (first payment on June 15, 1989), solve for the price per 100 (P) at a yield of 9.79%. Accrued interest is calculated from October 15 to November 15.

Definitions:

C = 9.75.
i = .0979.
n = 12.
r = 30 (November 15, 1988, to December 15, 1988).
s = 183 (June 15, 1988, to December 15, 1988).
r′ = 61 (October 15, 1988, to December 15, 1988).
v = 1 / (1 + .0979/2), or .9533342867.
$v^n$ = [1 / (1 + .0979/2)]$^{12}$, or .5635631040.
$a_{\overline{n}|}$ = (1 − .5635631040)/.04895, or 8.9159733613.
A = [(61 − 30)/183](9.75/2), or .825820.

Resolution:

(P + A)[1 + (r/s)(i/2)] = [(r′/s)(C/2)]v + (C/2)$a_{\overline{n}|}$ + 100$v^n$ or
(P + .825820)[1 + (30/183)(.0979/2)] = [(61/183)(9.75/2)](.9533342867) + (9.75/2)(8.9159733613) + 100(.5635631040).
(1) (P + .825820)[1+ .00802459] = 1.549168216 + 43.4653701362 + 56.35631040.
(2) (P + .825820)[1.00802459] = 101.3708487520.
(3) (P + .825820) = 101.3708487520 / 1.00802459.
(4) (P + .825820) = 100.563865.
(5) P = 100.563865 −. 825820.
(6) P = 99.738045.

III. FORMULAS FOR CONVERSION OF INFLATION-INDEXED SECURITY YIELDS TO EQUIVALENT PRICES

*Definitions*

P = unadjusted or real price per 100 (dollars).
$P_{adj}$ = inflation adjusted price; P × Index $Ratio_{Date}$.
A = unadjusted accrued interest per $100 original principal.
$A_{adj}$ = inflation adjusted accrued interest; A× Index $Ratio_{Date}$.
SA = settlement amount including accrued interest in current dollars per $100 original principal; $P_{adj}$ + $A_{adj}$.
r = days from settlement date to next coupon date.
s = days in current semiannual period.
i = real yield, expressed in decimals (e.g., 0.0325).
C = real annual coupon, payable semiannually, in terms of real dollars paid on $100 initial, or real, principal of the security.
n = number of full semiannual periods from issue date to maturity date, except that, if the issue date is a coupon frequency date, n will be one less than the number of full semiannual periods remaining until maturity. Coupon frequency dates are the two semiannual dates based on the maturity date of each note or bond issue. For example, a security maturing on July 15, 2026 would have coupon frequency dates of January 15 and July 15.
$v^n$ = 1/(1 + i/2)$^n$ = present value of 1 due at the end of n periods.
$a_{\overline{n}|}$ = (1 − $v^n$)/(i/2) = v + $v^2$ + $v^3$ + ··· + $v^n$ = present value of 1 per period for n periods.

Special Case: If i = 0, then $a_{\overline{n}|}$ = n. Furthermore, when i = 0, $a_{\overline{n}|}$ cannot be calculated using the formula: (1 − $v^n$)/(i/2). In the special case where i = 0, $a_{\overline{n}|}$ must be calculated as the summation of the individual present values (i.e., v + $v^2$ + $v^3$ + ··· + $v^n$). Using the summation method will always confirm that $a_{\overline{n}|}$ = n when i = 0.

Date = valuation date.
D = the number of days in the month in which Date falls.
t = calendar day corresponding to Date.
CPI = Consumer Price Index number.
$CPI_M$ = CPI reported for the calendar month M by the Bureau of Labor Statistics.
Ref $CPI_M$ = reference CPI for the first day of the calendar month in which Date falls (also equal to the CPI for the third preceding calendar month), e.g., Ref $CPI_{April\ 1}$ is the $CPI_{January}$.
Ref $CPI_{M+1}$ = reference CPI for the first day of the calendar month immediately following Date.
Ref $CPI_{Date}$ = Ref $CPI_M$ − [(t − 1)/D][Ref $CPI_{M+1}$–Ref $CPI_M$].
Index $Ratio_{Date}$ = Ref $CPI_{Date}$ / Ref $CPI_{IssueDate}$.

NOTE: When the Issue Date is different from the Dated Date, the denominator is the Ref $CPI_{DatedDate}$.

A. *For inflation-indexed securities with a regular first interest payment period:*

Formulas:

$$P = \frac{(C/2) + (C/2)a_{\overline{n}|} + 100v^n}{1 + (r/s)(i/2)} - [(s-r)/s](C/2)$$

$P_{adj}$ = P × Index $Ratio_{Date}$.
A = [(s − r)/s] × (C/2).
$A_{adj}$ = A × Index $Ratio_{Date}$.
SA = $P_{adj}$ + $A_{adj}$
Index $Ratio_{Date}$ = Ref $CPI_{Date}$/Ref $CPI_{IssueDate}$.

Example:

We issued a 10-year inflation-indexed note on January 15, 1999. The note was issued at a discount to yield of 3.898% (real). The note bears a 3⅞% real coupon, payable on July 15 and January 15 of each year. The base CPI index applicable to this note is 164. (We normally derive this number using the interpolative process described in appendix B, section I, paragraph B.)

Definitions:

C = 3.875.
i = 0.03898.
n = 19 (There are 20 full semiannual periods but n is reduced by 1 because the issue date is a coupon frequency date.).
r = 181 (January 15, 1999 to July 15, 1999).
s = 181 (January 15, 1999 to July 15, 1999).

Ref $CPI_{Date}$ = 164.
Ref $CPI_{IssueDate}$ = 164.

Resolution:

Index $Ratio_{Date}$ = Ref $CPI_{Date}$ / Ref $CPI_{IssueDate}$ = 164/164 = 1.

A = [(181 − 181)/181] × 3.875/2 = 0.
$A_{adj} = 0 \times 1 = 0$.
$v^n = 1/(1 + i/2)^n = 1/(1 + .03898/2)^{19} = 0.692984572$.
$a_{n}\rceil = (1 - v^n)/(i/2) = (1 - 0.692984572)/(.03898/2) = 15.752459107$.

Formula:

$$P = \frac{(C/2) + (C/2)a_n\rceil + 100v^n}{1 + (r/s)(i/2)} - [(s - r)/s](C/2)$$

$$P = \frac{(3.875/2) + (3.875/2)(15.752459107) + 100(0.692984572)}{1 + (181/181)(0.03898/2)} - [(181 - 181)/181](3.875/2)$$

$$P = \frac{1.9375 + 30.52038952 + 69.29845720}{1.01949000} - 0$$

$$P = \frac{101.75634672}{1.01949000}$$

P = 99.811030.
$P_{adj}$ = P × Index $Ratio_{Date}$.
$P_{adj}$ = 99.811030 × 1 = 99.811030.
SA = $P_{adj}$ × $A_{adj}$.
SA = 99.811030 + 0 = 99.811030.

NOTE: For the real price (P), we have rounded to six places. These amounts are based on 100 par value.

B. (1) *For inflation-indexed securities reopened during a regular interest period where the purchase price includes predetermined accrued interest.*

(2) *For new inflation-indexed securities accruing interest from the coupon frequency date immediately preceding the issue date, with the interest rate established in the auction being used to determine the accrued interest payable on the issue date.*

*Bidding:* The dollar amount of each bid is in terms of the par amount. For example, if the Ref CPI applicable to the issue date of the note is 120, and the reference CPI applicable to the reopening issue date is 132, a bid of $10,000 will in effect be a bid of $10,000 × (132/120), or $11,000.

Formulas:

$$P = \frac{(C/2) + (C/2)a_n\rceil + 100v^n}{1 + (r/s)(i/2)} - [(s - r)/s](C/2)$$

$P_{adj}$ = P × Index $Ratio_{Date}$.
A = [(s − r)/s] × (C/2).
$A_{adj}$ = A × Index $Ratio_{Date}$.
SA = $P_{adj}$ + $A_{adj}$.
Index $Ratio_{Date}$ = Ref $CPI_{Date}$/Ref $CPI_{IssueDate}$.

Example:

We issued a 3⅝% 10-year inflation-indexed note on January 15, 1998, with interest payments on July 15 and January 15. For a reopening on October 15, 1998, with inflation compensation accruing from January 15, 1998 to October 15, 1998, and accrued interest accruing from July 15, 1998 to October 15, 1998 (92 days), solve for the price per 100 (P) at a real yield, as determined in the reopening auction, of 3.65%. The base index applicable to the issue date of this note is 161.55484 and the reference CPI applicable to October 15, 1998, is 163.29032.

Definitions:

C = 3.625.
i = 0.0365.
n = 18.
r = 92 (October 15, 1998 to January 15, 1999).
s = 184 (July 15, 1998 to January 15, 1999).
Ref $CPI_{Date}$ = 163.29032.
Ref $CPI_{IssueDate}$ = 161.55484.

Resolution:

Index $Ratio_{Date}$ = Ref $CPI_{Date}$/Ref $CPI_{IssueDate}$ = 163.29032/161.55484 = 1.01074.
$v^n = 1/(1 + i/2)^n = 1/(1 + .0365/2)^{18} = 0.722138438$.
$a_n\rceil = (1 - v^n)/(i/2) = (1 - 0.722138438)/(.0365/2) = 15.225291068$.

Formula:

$$P = \frac{(C/2) + (C/2)a_n\rceil + 100v^n}{1 + (r/s)(i/2)} - [(s - r)/s](C/2)$$

$$P = \frac{(3.625/2) + (3.625/2)(15.225291068) + 100(0.722138438)}{1 + (92/184)(0.0365/2)} - [(184 - 92)/184](3.625/2)$$

$$P = \frac{1.8125 + 27.59584006 + 72.21384380}{1.009125} - (92/184)(1.8125)$$

$$P = \frac{101.62218386}{1.009125} - 0.906250$$

P = 100.703267 − 0.906250.

P = 99.797017.

$P_{adj} = P \times \text{Index Ratio}_{Date}$.
$P_{adj} = 99.797017 \times 1.01074 = 100.86883696$.
$P_{adj} = 100.868837$.
$A = [(184-92)/184] \times 3.625/2 = 0.906250$.
$A_{adj} = A \times \text{Index Ratio}_{Date}$.
$A_{adj} = 0.906250 \times 1.01074 = 0.91598313$.
$A_{adj} = 0.915983$.
$SA = P_{adj} + A_{adj} = 100.868837 + 0.915983$.
$SA = 101.784820$.

NOTE: For the real price (P), and the inflation-adjusted price ($P_{adj}$), we have rounded to six places. For accrued interest (A) and the adjusted accrued interest ($A_{adj}$), we have rounded to six places. These amounts are based on 100 par value.

IV. COMPUTATION OF ADJUSTED VALUES AND PAYMENT AMOUNTS FOR STRIPPED INFLATION-PROTECTED INTEREST COMPONENTS

NOTE: Valuing an interest component stripped from an inflation-protected security at its adjusted value enables this interest component to be interchangeable (fungible) with other interest components that have the same maturity date, regardless of the underlying inflation-protected security from which the interest components were stripped. The adjusted value provides for fungibility of these various interest components when buying, selling, or transferring them or when reconstituting an inflation-protected security.

Definitions:

c = C/100 = the regular annual interest rate, payable semiannually, e.g., .03625 (the decimal equivalent of a 3⅝% interest rate)

Par = par amount of the security to be stripped

Ref $CPI_{IssueDate}$ = reference CPI for the original issue date (or dated date, when the dated date is different from the original issue date) of the underlying (unstripped) security

Ref $CPI_{Date}$ = reference CPI for the maturity date of the interest component

AV = adjusted value of the interest component

PA = payment amount at maturity by Treasury

Formulas:

AV = Par(C/2)(100/Ref $CPI_{IssueDate}$) (rounded to 2 decimals with no intermediate rounding)

PA = AV(Ref $CPI_{Date}$/100) (rounded to 2 decimals with no intermediate rounding)

Example:

A 10-year inflation-protected note paying 3⅞% interest was issued on January 15, 1999, with the second interest payment on January 15, 2000. The Ref CPI of January 15, 1999 (Ref $CPI_{IssueDate}$) was 164.00000, and the Ref CPI on January 15, 2000 (Ref $CPI_{Date}$) was 168.24516. Calculate the adjusted value and the payment amount at maturity of the interest component.

Definitions:

c = .03875
Par = $1,000,000
Ref $CPI_{IssueDate}$ = 164.00000
Ref $CPI_{Date}$ = 168.24516

Resolution:

For a par amount of $1 million, the adjusted value of each stripped interest component was $1,000,000(.03875/2)(100/164.00000), or $11,814.02 (no intermediate rounding).

For an interest component that matured on January 15, 2000, the payment amount was $11,814.02 (168.24516/100), or $19,876.52 (no intermediate rounding).

V. COMPUTATION OF PURCHASE PRICE, DISCOUNT RATE, AND INVESTMENT RATE (COUPON-EQUIVALENT YIELD) FOR TREASURY BILLS

A. *Conversion of the discount rate to a purchase price for Treasury bills of all maturities:*

Formula:

P = 100 (1 − dr / 360).

Where:

d = discount rate, in decimals.
r = number of days remaining to maturity.
P = price per 100 (dollars).

Example:

For a bill issued November 24, 1989, due February 22, 1990, at a discount rate of 7.610%, solve for price per 100 (P).

Definitions:

d = .07610.
r = 90 (November 24, 1989 to February 22, 1990).

Resolution:

P = 100 (1 − dr / 360).
(1) P = 100 [1 − (.07610)(90) / 360].
(2) P = 100 (1 − .019025).
(3) P = 100 (.980975).
(4) P = 98.097500.

NOTE: Purchase prices per $100 are rounded to six decimal places, using normal rounding procedures.

B. *Computation of purchase prices and discount amounts based on price per $100, for Treasury bills of all maturities:*

1. To determine the purchase price of any bill, divide the par amount by 100 and multiply the resulting quotient by the price per $100.

Example:

To compute the purchase price of a $10,000 13-week bill sold at a price of $98.098000 per $100, divide the par amount ($10,000) by 100 to obtain the multiple (100). That multiple times 98.098000 results in a purchase price of $9,809.80.

2. To determine the discount amount for any bill, subtract the purchase price from the par amount of the bill.

Example:

For a $10,000 bill with a purchase price of $9,809.80, the discount amount would be $190.20, or $10,000 − $9,809.80.

C. *Conversion of prices to discount rates for Treasury bills of all maturities:*

Formula:

$$d = \left[\frac{100 - P}{100} \times \frac{360}{r}\right]$$

Where:

P = price per 100 (dollars).
d = discount rate.
r = number of days remaining to maturity.

Example:

For a 26-week bill issued December 30, 1982, due June 30, 1983, with a price of $95.934567, solve for the discount rate (d).

Definitions:

P = 95.934567.
r = 182 (December 30, 1982, to June 30, 1983).

Resolution:

$$d = \left[\frac{100 - P}{100} \times \frac{360}{r}\right]$$

$$d = \left[\frac{100 - 95.934567}{100} \times \frac{360}{182}\right]$$

(2) $d = [.04065433 \times 1.978021978]$.
(3) d = .080415158.
(4) d = 8.042%.

NOTE: Prior to April 18, 1983, we sold all bills in price-basis auctions, in which discount rates calculated from prices were rounded to three places, using normal rounding procedures. Since that time, we have sold bills only on a discount rate basis.

D. *Calculation of investment rate (coupon-equivalent yield) for Treasury bills:*

1. *For bills of not more than one half-year to maturity:*

Formula:

$$i = \left[\frac{100 - P}{P} \times \frac{y}{r}\right]$$

Where:

i = investment rate, in decimals.
P = price per 100 (dollars).
r = number of days remaining to maturity.
y = number of days in year following the issue date; normally 365 but, if the year following the issue date includes February 29, then y is 366.

Example:

For a cash management bill issued June 1, 1990, due June 21, 1990, with a price of $99.559444 (computed from a discount rate of 7.930%), solve for the investment rate (i).

Definitions:

P = 99.559444.
r = 20 (June 1, 1990, to June 21, 1990).
y = 365.

Resolution:

$$i = \left[\frac{100 - P}{P} \times \frac{y}{r}\right]$$

$$(1)\ i = \left[\frac{100 - 99.559444}{99.559444} \times \frac{365}{20}\right]$$

(2) $i = [.004425 \times 18.25]$.
(3) i = .080756.
(4) i = 8.076%.

2. For bills of more than one half-year to maturity:

Formula:

$P\,[1 + (r - y/2)(i/y)]\,(1 + i/2) = 100$.

This formula must be solved by using the quadratic equation, which is:

$ax^2 + bx + c = 0$.

Therefore, rewriting the bill formula in the quadratic equation form gives:

$$\left[\frac{r}{2y} - .25\right] i^2 + \left(\frac{r}{y}\right) i + \left(\frac{P - 100}{P}\right) = 0$$

and solving for "i" produces:

$$i = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

Where:

i = investment rate in decimals.
b = r/y.
a = (r/2y) − .25.
c = (P − 100)/P.
P = price per 100 (dollars).
r = number of days remaining to maturity.
y = number of days in year following the issue date; normally 365, but if the year following the issue date includes February 29, then y is 366.

Example:

For a 52-week bill issued June 7, 1990, due June 6, 1991, with a price of $92.265000 (computed from a discount rate of 7.65%), solve for the investment rate (i).

Definitions:

r = 364 (June 7, 1990, to June 6, 1991).
y = 365.
P = 92.265000.
b = 364 / 365, or .997260274.
a = (364 / 730) − .25, or .248630137.
c = (92.265 − 100) / 92.265, or −.083834607.

Resolution:

$$i = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$(1)\ i = \frac{-.997260274 + \sqrt{(.997260274)^2 - 4[(.248630137)(-.083834607)]}}{2(.248630137)}$$

$$(2)\ i = \frac{-.997260274 + \sqrt{.994528054 + .083375239}}{.497260274}$$

(3) i = ( − .997260274 + 1.038221216) / .497260274.
(4) i = .040960942 / .497260274.
(5) i = .082373244 or
(6) i = 8.237%.

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## APPENDIX C TO PART 356—INVESTMENT CONSIDERATIONS

### I. INFLATION-PROTECTED SECURITIES

#### *A. Principal and Interest Variability*

An investment in securities with principal or interest determined by reference to an inflation index involves factors not associated with an investment in a fixed-principal security. Such factors include the possibility that:

- The inflation index may be subject to significant changes,
- changes in the index may or may not correlate to changes in interest rates generally or with changes in other indices,
- the resulting interest may be greater or less than that payable on other securities of similar maturities, and
- in the event of sustained deflation, the amount of the semiannual interest payments, the inflation-adjusted principal of the security, and the value of stripped components will decrease. However, if at maturity the inflation-adjusted principal is less than a security's par amount, we will pay an additional amount so that the additional amount plus the inflation-adjusted principal equals the par amount. Regardless of whether or not we pay such an additional amount, we will always base interest payments on the inflation-adjusted principal as of the interest payment date. If a security has been stripped, we will pay any such additional amount at maturity to holders of principal components only. (See §356.30.)

#### *B. Trading in the Secondary Market*

The Treasury securities market is the largest and most liquid securities market in the world. The market for Treasury inflation-protected securities, however, may not be as active or liquid as the market for Treasury fixed-principal securities. In addition, Treasury inflation-protected securities may not be as widely traded or as well understood as Treasury fixed-principal securities. Lesser liquidity and fewer market participants may result in larger spreads between bid and asked prices for inflation-protected securities than the bid-asked spreads for fixed-principal securities with the same time to maturity. Larger bid-asked spreads normally result in higher transaction costs and/or lower overall returns. The liquidity of an inflation-protected security may be enhanced over time as we issue additional amounts or more entities participate in the market.

#### *C. Tax Considerations*

Treasury inflation-protected securities and the stripped interest and principal components of these securities are subject to specific tax rules provided by Treasury regulations issued under sections 1275(d) and 1286 of the Internal Revenue Code of 1986, as amended.

#### *D. Indexing Issues*

While the Consumer Price Index (''CPI'') measures changes in prices for goods and services, movements in the CPI that have occurred in the past do not necessarily indicate changes that may occur in the future.

The calculation of the index ratio incorporates an approximate three-month lag, which may have an impact on the trading price of the securities, particularly during periods of significant, rapid changes in the index.

The CPI is reported by the Bureau of Labor Statistics, a bureau within the Department of Labor. The Bureau of Labor Statistics operates independently of Treasury and, therefore, we have no control over the determination, calculation, or publication of the index. For a discussion of how we will apply the CPI in various situations, see appendix B, section I, paragraph B of this part. In addition, for a discussion of actions that we would take in the event the CPI is: discontinued; in the judgment of the Secretary, fundamentally altered in a manner materially adverse to the interests of an investor in the security; or, in the judgment of the Secretary, altered by legislation or Executive Order in a manner materially adverse to the interests of an investor in the security, see appendix B, section I, paragraph B.4 of this part.