Negative Net Discount Rates: When are They Appropriate?

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Annual Conference, March 22, 2014
Net Discount Rates (NDR): Why Use?

• There is always much uncertainty in setting or deriving both discount rates and earnings growth rates in calculating PV of lost future earnings/earning capacity

• During a period of high inflation, in its 1983 Pfeifer decision, Supreme Court gave legal sanction to a concept close to NDR in netting out expected inflation, a key component of future earnings growth.*
  
  – Court said that after accounting for all factors affecting expected wage increases and market interest rates excluding that of price inflation, a "real interest rate" approach would be acceptable. Specifically it said:
  
  – “... we do not believe a trial court adopting such an approach ... should be reversed if it adopts a rate between 1 and 3% and explains its choice.”

* While future inflation is not the same as future earnings growth, they obviously are closely related, and this may be why FEs often assume an NDR of 1 to 3% is acceptable to the courts.
Deriving the Net Discount Rate

\[ \text{LostWages} = \frac{w_0(1 + g)}{(r - g)} \left[ 1 - \left( \frac{1 + g}{1 + r} \right)^T \right] \]

\[ \text{LostWages} = \frac{w_0}{NDR} \left[ 1 - \left( \frac{1}{1 + NDR} \right)^T \right] = w_0 \frac{1 - (1 + NDR)^{-T}}{NDR} \]

\[ NDR = \frac{(r - g)}{(1 + g)} \] and if estimated from historical data = \[ \frac{1}{N} \sum_{i=1}^{N} \left( \frac{r_i - g_i}{1 + g_i} \right) \]

\( NDR \) is often shortened to \( r_i - g_i \)
Is NDR “Stationary”?

- Cushing and Rosenbaum posed this question (JFE, 2006):
  - If “yes”, then shocks are transitory and series reverts to a long term mean value; estimates based on historical values would be reasonable
  - If “no”, then past observances have questionable predictive value; best predictor of next period’s rate is the current rate
- C&R concluded stationarity was inherently uncertain. While they devised a data-based optimal NDR estimator containing both current and historical average NDRs, for practicality C&R proposed a compromise estimator that resulted in an even split between current and historical average NDRs
- Clark, Coggin and Neale (Journal of Risk & Insurance, 2008) also confirmed ambiguity on stationarity of “NDR Ratio” in 10 prior studies by 8 sets of authors. (All studies used treasury maturities ranging from 3 mo to 10 yrs)
- In one of those studies generally supportive of stationarity, Payne et al (JLE, 1999) cautioned FEs to “… be aware of structural breaks in the economy … when applying averages of historical net discount rates” which then “… would be misleading as an indicator of the future course of the economy”
"Net Discount Rates" for Different Treasury Maturities
(~ Interest Rate less Earnings Growth Rate, BLS Series*)

* Growth rate from BLS series on average earnings of production and non-supervisory workers in private non-farm payrolls
"Net Discount Rates" for Different Treasury Maturities
(\(\sim\) Interest Rate less Earnings Growth Rate, SSA Series*)

* Growth rate from SSA/OASDI series on covered wages and net self-employment earnings / net proprietors' income
Measuring NDR After-The-Fact is Different from Projecting NDR

Whether or not NDR is statistically stationery is really besides the point in terms of forecasting

– Historical data show NDR is highly volatile
– Selection of any single NDR can be viewed as arbitrary and unrelated to current bond market and labor market conditions
– Rate of inflation clearly affects historical NDRs, as well as choice of earnings growth rate measure
When is a Negative NDR Reasonable?

• Most appropriate as a result of using current market yields and current expected earnings growth rates, rather than as an a priori assumption

• Many FEs use most recent earnings growth rate forecasts (e.g., CBO, SSA/OASDI), but difficult to time-sync those forecasts with current bond market conditions
## Compound Real Annual Growth Rates of Wages & Salaries Net of Inflation (1)

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of Recessions</th>
<th>Covered Wages &amp; Self-Employment Net Earnings, OASDI/SSA (2)</th>
<th>Employment Cost Index, (ECI) BLS/ CBO (3)</th>
<th>Production &amp; Non-Supervisory Workers, Private Ind., BLS (4)</th>
<th>Mean Earnings, All FTYR Workers, Census (5)</th>
<th>Mean Earnings, FTYR Workers w/ &lt; BA, Census</th>
<th>Mean Earnings, FTYR Workers w/ ≥ BA, Census</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual 1974-2012</td>
<td>6</td>
<td>0.89%</td>
<td>N/A</td>
<td>-0.05%</td>
<td>0.52%</td>
<td>0.02%</td>
<td>0.46%</td>
</tr>
<tr>
<td>Actual 1980-2012</td>
<td>4</td>
<td>0.99%</td>
<td>0.42%</td>
<td>0.13%</td>
<td>0.70%</td>
<td>0.16%</td>
<td>0.71%</td>
</tr>
<tr>
<td>Actual 1991-2012</td>
<td>2</td>
<td>1.03%</td>
<td>0.48%</td>
<td>0.58%</td>
<td>0.83%</td>
<td>0.29%</td>
<td>0.69%</td>
</tr>
<tr>
<td>Actual 1991-2006</td>
<td>1</td>
<td>1.46%</td>
<td>0.68%</td>
<td>0.62%</td>
<td>1.15%</td>
<td>0.57%</td>
<td>1.27%</td>
</tr>
<tr>
<td>Actual 2002-2012</td>
<td>1</td>
<td>0.40%</td>
<td>-0.09%</td>
<td>0.32%</td>
<td>0.01%</td>
<td>-0.39%</td>
<td>-0.54%</td>
</tr>
<tr>
<td>Forecast 2014-2023</td>
<td>N/A</td>
<td>1.90%</td>
<td>1.24%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Forecast 2024</td>
<td>N/A</td>
<td>1.12%</td>
<td>1.18%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

(1) Nominal earnings for each actual historical period is net of inflation measured by CPI-U-RS (research series), BLS index supplemented by Census Bureau. Since 2013 results for OASDI/SSA are not yet available, historical period comparisons only extend through 2012.

(2) Old Age Survivors Insurance and Disability Insurance Trust Funds (OASDI), Social Security Admin. CPI-W used for forecasted inflation.

(3) ECI is calculated by Bureau of Labor Statistics (BLS) and forecasted by Congressional Budget Office (CBO).

(4) BLS Table B-8, from Current Employment Statistics (Household Survey); not forecasted.

(5) From Census Bureau’s "Current Population Survey" (conducted with BLS) for full-time year-round workers. Aggregation by education level from ASSA 2014 paper by Ed Foster. Note: Real wage growth for all workers is not a weighted average of growth rates for those with < BA & ≥ BA, since weights change over time, reflecting increased % of population with BA degree or higher.
Forecasted Earnings Growth from SSA & CBO and Average Real Growth Rates from 1980-2012 observed via Census/CPS *

Present Value of Future Earnings (Discounted at Current Yld Ladder as of 2-26-2014, in $Million)

<table>
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<tr>
<th>OASDI/SSA</th>
<th>ECI/CBO</th>
<th>Infl.+.7%</th>
<th>Infl.+.16%</th>
<th>No Disc/Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.538</td>
<td>$1.360</td>
<td>$1.297</td>
<td>$1.202</td>
<td>$1.333</td>
</tr>
</tbody>
</table>

(Zero NDR)

* From Census/CPS: Inflation + .7% was avg for all workers & close to avg for ones w/ >= BS. Inflation + .16% was avg of workers w/ only < BS. Inflation assumption from CBO forecast applied to real earnings growth rates observed via Census/CPS. Base year earnings = $43K
Problem: Forecasts Out-of-Sync w/ Current Yields & Inflation

• Negative NDRs may be biased as result of using dated earnings forecasts with current market yields that may embed different inflation expectations

• Imperfect alternative: Federal Reserve Research Series provides “Breakeven rates” aka “inflation compensation”. Thus, can take real earnings growth rates from forecasts (CBO & SSA), or historical averages from Census (by education level, if desired), and assume that “inflation compensation” [labeled “BKEVEN” by Fed] = implied inflation expectations:

  \[ \text{BKEVEN}_t \text{ (BEY)} = \text{Nominal Tsy Yld}_t - \text{TIPS Yld}_t = \text{Cumulative Inflation Compensation as of yr t} \]

  For Annual Inflation Comp. in each future yr, can derive forward rates from BKEVEN series:

  \[ \text{Annual Inflation Compensation}_t = (1 + \text{BKEVEN}_t/2)^{t*2} / (1 + \text{BKEVEN}_{t-1}/2)^{(t-1)*2} - 1 \]

• However, Fed Reserve Research Series offers this caveat:

  “inflation compensation” may not exactly = “inflation expectation” since

  ... [Breakeven rates] incorporate inflation risk premiums [+ to BKEVEN] and the effects of the differential liquidity of TIPS and nominal securities [- to BKEVEN]. Consequently breakeven rates should not be interpreted as estimates of inflation expectations”

• Caveat emptor, what else to use for daily inflation expectations?
Forecasted Real Earnings Growth Only from SSA & CBO and Average Real Growth Rates from 1980-2012 observed via Census/CPS *

Present Value of Future Earnings
(Discounted at Current Yld Ladder as of 2-26-2014, in $Million)

- OASDI/SSA: $1.437
- ECI/CBO: $1.344
- Infl.+.7%: $1.291
- Infl.+.16%: $1.196
- No Disc/Growth: $1.333 (Zero NDR)

* From Census/CPS: Inflation + .7% was avg for all workers & close to avg for ones w/ >= BS. Inflation + .16% was avg of workers w/ only < BS. Inflation derived from yield curve differential, Nominal Treasuries vs. TIPS; applied to all real growth forecasts. Base Yr earnings = $43K
Conclusion

• Negative NDRs may be appropriate at times. However, for proponents of current market yields, negative NDRs can be appropriate only as a result, not as an a priori assumption.

• Using popular forecasts such as CBO and SSA with current market yields may imply acceptance of negative NDRs. As a related issue, CBO and SSA do not reflect educational differences in real earnings growth rates, and may not be appropriate for all plaintiffs. Instead may vary real earnings growth w/ education.

• Problem: Earnings growth forecasts are chronologically “out-of-sync” w/ current market yields and expected inflation. May not be big problem unless inflation expectations change “materially” from time of earnings growth forecast.

• If inflation expectations do change materially after an earnings growth forecast was made, this is imperfectly remediable by:
  – Assuming Federal Reserve Research Series “breakeven rates” aka “inflation compensation” is roughly equal to cumulative inflation expectations as of each future year.
  – Deriving implied annual inflation expectations for each future year from the forward rates obtained from the “breakeven rate” series.
  – Combine current annual inflation forecast with real earnings growth component to obtain a revised nominal earnings growth forecast. This would be most chronologically compatible method when discounting with current market yields.