What Happens if you Divest?
About Aperio Group

- $9b employee-owned firm based in Sausalito, California
- Clients: UHNW families; Endowments & Foundations
- Customized **passively-managed** public equity portfolios in 1700+ separately managed accounts (SMAs)
- Thirteen year track record of successfully tracking benchmarks while delivering on customized mandates
- Aperio & Divestment
Defining the Goal/Motivation

- Match the market?
- Improve risk/return – e.g. stranded assets theory
- Divestment? Penalize the producers
- Lower carbon footprint? Reward the conscientious consumers
Quantifying Impact of Divestment

- Assume neutral on returns (values alignment vs. alpha seeking)
- Investors rely on two statistical measures
  - Absolute risk (standard deviation, measures volatility)
  - Tracking error (TE = comparative risk vs. benchmark)
  - The stricter the screening, the higher the TE
- Theory says you should get paid more for bearing more risk
- A note on Beta & Alpha (improving risk/return or match the market)
What Is Tracking Error?

- TE measures variation around a benchmark

- With an indexing approach, tracking error has an expected value of zero
- Theoretically half the time it will be positive and half the time negative
Options for Divesting

● Definition?
  ● Coal
  ● Reserves (e.g.) Underground 200™
  ● Industry: Oil, Gas & Consumable Fuels
  ● Tar sands
  ● Frakking
  ● Worst carbon footprint
  ● Something else?

● Divesting – Passive
  ● Unoptimized
  ● Optimized

● Divesting – Active
  ● Constraining the opportunity set?
Impact of Tracking Error – Passive & Reoptimized

Tracking Error vs. Screening

<table>
<thead>
<tr>
<th></th>
<th>Exclude &quot;Filthy 15&quot;</th>
<th>Full Carbon Divestment</th>
<th>Full Carbon + Positive</th>
<th>Avg. Active Mgr.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\sigma_e$</td>
<td>Trkg. Err.</td>
<td>0.140%</td>
<td>0.598%</td>
<td>0.911%</td>
</tr>
<tr>
<td>$\sigma_p$</td>
<td>Incr. Risk</td>
<td>0.001%</td>
<td>0.010%</td>
<td>0.023%</td>
</tr>
<tr>
<td>Stocks Excl.</td>
<td></td>
<td>13</td>
<td>134</td>
<td>134</td>
</tr>
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</table>


Incremental risk assumes forecast market risk of 17.67%; tracking error shown vs. Russell 3000. (Source: Barra Aegis.)
How Would Strategies Have Performed in the Past?

- Simulate historical performance using same multi-factor models used to create portfolios
- For U.S. market, slight positive tracking error over past 25 years
- Past performance is no guarantee of future results
  - Particularly true for back-tested data
  - Technical version: take back tests with a grain of salt
  - Danger of cherry-picking
How Would A Divested Strategy Performed?

Annualized Return Difference, Rolling 10-Year Periods

Return numbers show annualized return difference between Full Carbon Divestment portfolio and Russell 3000 for periods from Jan 1988 to Dec 2012.

Average Annualized 10-year Return Difference +0.08%
Percentage of Periods Higher than R3000 73%
Percentage of Periods Lower than R3000 27%
Tracking error, current forecast 0.60%
Tracking error, historical simulation 0.78%

Please see Disclosure slide for details.
Options for Divesting in Public Equities

- Funds
- ETFs
- SMAs
# Appendix: Standard Deviation of S&P500

<table>
<thead>
<tr>
<th>Year</th>
<th>Standard Deviation</th>
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<tbody>
<tr>
<td>2006</td>
<td>15.79%</td>
</tr>
<tr>
<td>2005</td>
<td>4.91%</td>
</tr>
<tr>
<td>2004</td>
<td>10.88%</td>
</tr>
<tr>
<td>2003</td>
<td>28.69%</td>
</tr>
<tr>
<td>2002</td>
<td>-22.10%</td>
</tr>
<tr>
<td>2001</td>
<td>-11.89%</td>
</tr>
<tr>
<td>2000</td>
<td>-9.10%</td>
</tr>
<tr>
<td>1999</td>
<td>21.04%</td>
</tr>
<tr>
<td>1998</td>
<td>28.58%</td>
</tr>
<tr>
<td>1997</td>
<td>33.36%</td>
</tr>
<tr>
<td>1996</td>
<td>22.96%</td>
</tr>
<tr>
<td>1995</td>
<td>37.58%</td>
</tr>
<tr>
<td>1994</td>
<td>1.32%</td>
</tr>
<tr>
<td>1993</td>
<td>10.07%</td>
</tr>
<tr>
<td>1992</td>
<td>7.62%</td>
</tr>
<tr>
<td>1991</td>
<td>30.47%</td>
</tr>
<tr>
<td>1990</td>
<td>-3.10%</td>
</tr>
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Average: 12.2%
Std. Dev.: 17.3%
Important Note

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With respect to the description of any investment strategies, simulations, or investment recommendations, we cannot provide any assurances that they will perform as expected and as described in our materials. Past performance is not indicative of future results. Every investment program has the potential for loss as well as gain.

Assumptions underlying simulated back test:
Based on Barra Aegis multi-factor risk model
Quarterly rebalancing.
Exclude stocks from Oil Gas & Consumable Fuels industry as defined by MSCI Barra industry for back test.
No transaction costs or management fees included.
Benchmark returns are simulated using underlying holdings to ensure apples-to-apples comparison.

The benchmark for back-test simulation is the Russell 3000 total return index. The simulated portfolios are actively managed, and the structure of the actual portfolios and composites may be at variance to the benchmark index. Index returns reflect reinvestment of dividends but do not reflect fees, brokerage commissions, or other expenses of investing, which can reduce actual returns earned by investors.

Performance results from back tests of particular strategies exclude any trading or management fees that would reduce the return. Furthermore, future returns for any such strategies could be worse than the results shown or the identified benchmark. Back-testing involves simulation of a quantitative investment model by applying all rules, thresholds and strategies to a hypothetical portfolio during a specific market period and measuring the changes in value of the hypothetical portfolio based on the actual market prices of portfolio securities. Investors should be aware of the following: 1) Back-tested performance does not represent actual trading in an account and should not be interpreted as such, 2) back-tested performance does not reflect the impact that material economic and market factors might have had on the manager’s decision-making process if the manager were actually managing client’s assets, 3) the investment strategy that the back-tested results are based on can be changed at any time in order to reflect better back-tested results, and the strategy can continue to be tested and adjusted until the desired results are achieved, and 4) there is no indication that the back-tested performance would have been achieved by the manager had the program been activated during the periods presented above.
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