IPART’s review of WACC methodology

Approaches for estimating implied market risk premiums and measuring economic uncertainty in Australia

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WACC determination framework

Estimating implied MRPs
- Constructing an implied MRP range and midpoint based on 6 MRP models

Measuring the level of economic uncertainty
- Constructing an index of economic uncertainty (ie, uncertainty index)
- Application of the uncertainty index within the WACC decision framework.
WACC determination framework

- 3-stage process:
  - Stage 1: Establish 2 WACC ranges based on long-term averages and current market data. Use the midpoints of these 2 WACC ranges as the upper and lower bounds of the final WACC range. The average of these midpoints is the midpoint of our final WACC range.
  - Stage 2: Choose a WACC point estimate within the range based on our WACC decision rule (based on the level of economic uncertainty).
  - Stage 3: Specify our point estimates for the cost of debt and the cost of equity, and the evidence we considered in choosing the WACC point estimate.
Why do we need implied MRPs?

- The cost of equity using long-term averages = Rf + beta*MRP estimated using historical data (ie, historical MRP)
- The cost of equity using current market data = Rf + beta*MRP estimated using current market (ie, implied MRP)

Why do we account for the level of economic uncertainty in determining the WACC?

- Risk premiums are likely to be affected by the level of economic uncertainty, affecting firms’ cost of capital.
- WACC decision cannot be made unconditionally from the level of economic uncertainty.
IPART’s method to estimate implied MRPs

IPART’s 6 MRP models to estimate implied MRPs:

<table>
<thead>
<tr>
<th>Methodology</th>
<th>DDM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Damodaran (2013)</td>
<td>Yes</td>
</tr>
<tr>
<td>4 SFG's methodology based on economic indicators</td>
<td>No</td>
</tr>
<tr>
<td>5 SFG's methodology based on analysts’ forecasts</td>
<td>Yes</td>
</tr>
<tr>
<td>6 Bloomberg's MRP estimates</td>
<td>Yes</td>
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</table>

Constructing an implied MRP range

- The maximum and minimum of the 6 implied MRPs are used as the upper and lower bounds of the implied MRP range.
- The midpoint of the implied MRP range is given by the average of the upper and lower bounds of the implied MRP range.
Background: Dividend discount model

- Dividend discount model (DDM): The intrinsic value of a common stock is equal to the discounted value of the cash flows that the stock could generate.

\[ V_o = \frac{E(D_1) + E(V_1)}{1 + E(r)} \]

where (i) \( V_o \) = current stock intrinsic value, (ii) \( E(D_1) \) and \( E(V_1) \) are the expected year-end dividend per share and price, respectively, and (iii) \( E(r) \) is the required rate of return on the stock.

- Assuming a constant \( E(r) \) over the next \( n \) years

\[ V_o = \frac{E(D_1)}{1 + E(r)} + \frac{E(D_2)}{(1 + E(r))^2} + \cdots + \frac{E(D_n + V_n)}{(1 + E(r))^n} \]

- Issues involved in this model:
  - How do dividends grow?
  - What is \( E(r) \)?
Estimating implied MRPs based on DDM

- If we assume that stocks are correctly priced in the aggregate and we can estimate the expected dividends from buying stocks, we can derive the expected rate of return on the market portfolio.

\[ V_0 = \frac{E(D_1)}{1 + E(r)} + \frac{E(D_2)}{(1 + E(r))^2} + \cdots + \frac{E(D_n + V_n)}{(1 + E(r))^n} \]

- The expected rate of return is given as an internal rate of return.
- Subtracting out the risk-free rate yields an implied MRP.
- This implied MRP is a forward-looking number and can be updated as often as you want.
Estimating an implied MRP: A simple example

▼ Classic stable growth model (Gordon growth model):

\[ V_0 = \frac{E(D_1)}{r - g} \]

where (i) \( V_0 \) = current stock intrinsic value, (ii) \( E(D_1) \) is the expected year-end dividend per share, (iii) \( r \) is the required rate of return on the stock, and (iv) \( g \) is the constant growth rate.

▼ On 29 November 2013, the S&P/ASX 200 Index was at 5320, the 10-year CGS was 4.1%, and dividend yield on the index was 4.1%. Also assume that dividends grow at a constant growth rate of 5.5%.

\[ 5320 = \frac{227.9}{r - 0.055} \]

▼ Expected return on the index = 9.8%
▼ Risk-free rate = 4.1%
▼ MRP = 9.8% - 4.1% = 5.7%
To estimate implied MRPs, we need:

- S&P/ASX 200 Index dividend yield
- S&P/ASX 200 Index price
- 10-year CGS yield
- Analysts’ EPS forecasts for 1, 2, and 3 years ahead, and long-term EPS growth rate (LTG).

Data source: Thomson Reuters Datastream

Implied MRPs are estimated monthly from November 2000.
Damodaran (2013): Model

\[ P_0 = \sum_{t=1}^{t=5} \frac{E(D_t)}{(1+r)^t} + \frac{E(D_6)}{(r-g)(1+r)^5} \]

\[ g_{GA} = \prod_{t=1}^{5} (1 + g_t)^{1/5} \]

- Over the first 5 years, dividends growth at \( g_{GA} \)

  - \( g_1 \) and \( g_2 \) are estimated using analysts' EPS forecasts for the index for 1-year and 2-year ahead.
  
  - \( g_3 \) and \( g_4 \) are estimated assuming a linear increase or decrease in the growth rate from \( g_2 \) to the long-term constant growth rate in the 5\(^{th} \) year (\( g_5 = g \)).

- After 5 years, the growth rate reverts to the long-term constant growth rate, \( g \). We assume \( g = 5.5\% \).

- The value of the index is given by the sum of:
  
  - The present value of the expected dividends over the next 5 years growing at \( g_{GA} \).
  
  - The present value of the expected dividends growing constantly at \( g \).
On 29 November 2013, the ASX 200 Index was at 5320. The 10-year CGS was 4.1% and dividend yield on the index was 4.1%.

Analysts' growth forecasts: 7.9% in the 1st year, 9.7% in the 2nd year, scaling down to 5.5% in the 5th year. This results in a compounded annual growth rate of 7.7%. We will assume that dividends will grow at 7.7% over the next 5 years.

After year 5, we will assume that dividends on the index will grow at 5.5% (constant growth rate).

Expected return on the index = 10.2%
Risk-free rate = 4.1%
MRP = 10.2% - 4.1% = 6.1%
Model (Simplified by Fuller and Hsia, 1984):

- Phase 1: Dividends grow at $g_{LTG}$ (analysts’ forecasts for long-term EPS growth) for the first 4 years.
- Phase 2: Dividend growth rate declines (or increases) in a linear fashion until year 12.
- Phase 3: After 12 years, dividends grow at a constant rate, $g$ (i.e., 5.5%).

The value of the index is given by the sum of:

- The present value of the expected dividends over the next 12 years, which grow at a different growth rate from a long-term constant growth rate (i.e., Phases 1 and 2 above).
- The present value of the expected dividends growing at a long-term constant growth rate after 12 years (i.e., Phase 3).
BoE (2002): Application

- On 29 November 2013, the ASX 200 Index was at 5320. The 10-year CGS was 4.1% and dividend yield on the index was 4.1%.

- $g_{LTG}$ for the ASX 200 Index was 9.1%.

\[
P_0 = \frac{D_0}{r - g} \left[ (1 + g) + 8(g_{LTG} - g) \right]
\]

\[
5320 = \frac{216.0}{r - 0.055} \left[ (1 + 0.055) + 8(0.091 - 0.055) \right]
\]

- Expected return on the index = 11.0%
- Risk-free rate: 4.1%
- MRP = 11.0% - 4.1% = 6.8%
BoE (2010): Model

Model:

\[
P_0 = \sum_{t=1}^{4} \frac{E(D_t)}{(1+r)^t} + \frac{E(D_5)}{(r-g)(1+r)^4}
\]

- \(g_1, g_2,\) and \(g_3\) are given by analysts’ forecasts for 1, 2, 3 years ahead.

- \(g_4\) is given by analysts’ forecasts for long-term growth (\(g_{LTG}\)).

The model sets the value of the index equal to the sum of:

- The present value of the expected dividends over the next 4 years, which grow at different rates each year.

- The present value of the expected dividends growing at a long-term constant growth rate of 5.5% after 4 years.
BoE (2010): Application

On 29 November 2013, the ASX 200 Index was at 5320. The 10-year CGS was 4.1% and dividend yield on the index was 4.1%

Growth rate forecasts: 7.9% in the 1st year, 9.7% in the 2nd year, 7.4% in the 3rd year, and 9.1% in the 4th year.

After 4 years, we will assume that dividends on the index will grow at 5.5% (constant growth rate).

29 November 2013, ASX 200 is at 5320. Dividend for base year is 216.0.

Expected return on the index = 10.3%
Risk-free rate = 4.1%
MRP = 10.3% - 4.1% = 6.1% (due to rounding)
Average implied MRPs based on Damodaran (2013), BoE (2002) and BoE (2010) over difference periods.

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<tr>
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<tbody>
<tr>
<td>All (Nov 2001 – Nov 2013)</td>
<td>6.8%</td>
<td>7.8%</td>
<td>6.9%</td>
</tr>
<tr>
<td>Pre-GFC (Nov 2001 – June 2008)</td>
<td>5.1%</td>
<td>6.0%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Post-GFC (Jul 2008 – Nov 2013)</td>
<td>7.6%</td>
<td>8.6%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Last 12 months</td>
<td>7.6%</td>
<td>8.1%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Last 6 months</td>
<td>7.3%</td>
<td>8.0%</td>
<td>7.4%</td>
</tr>
<tr>
<td>Last 3 months</td>
<td>7.3%</td>
<td>8.1%</td>
<td>7.4%</td>
</tr>
<tr>
<td>Latest (Nov 2013)</td>
<td>7.2%</td>
<td>8.0%</td>
<td>7.2%</td>
</tr>
</tbody>
</table>

Note: MRPs include the benefits of imputation credits
Choice of the constant growth rate, $g$

We use a constant growth rate of 5.5% in Damodaran (2013), BoE (2002) and BoE (2010).

- Historical average of the real growth rates = 3% (Lally, 2013).
- Assuming the long-term inflation rate of 2.5%, the nominal growth rate is given by:

$$g = (1 + 0.03)(1 + 0.025) - 1 \approx 0.056$$

Other choices of the constant growth rate include:

- Damodaran uses a monthly risk-free rate (ie, 10-year T-bond yield).
- The AER uses 4.6%.
- Endogenous determination: $g = \text{ROE} \times (1-\text{payout ratio}) = r \times (1-\text{payout ratio})$ where $r = \text{MRP} + R_f$. 

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Implied MRPs versus S&P/ASX 200 Index

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Implied MRP versus liquidity

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Various cost of equity estimates
Uncertainty Index: Data

- We construct a monthly uncertainty index from July 2001.
- Variables used to construct an index of economic uncertainty.
  - S&P/ASX 200 VIX Index
  - Dispersion in analysts’ EPS forecasts
  - Credit spread
  - Bills-OIS spread

- Cross-correlations of the 4 proxies for economic uncertainty

<table>
<thead>
<tr>
<th></th>
<th>S&amp;P/ASX 200 VIX Index</th>
<th>Dispersion</th>
<th>Credit spread</th>
<th>Bills-OIS spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dispersion</td>
<td>.832**</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Credit spread</td>
<td>.606**</td>
<td>.566**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Bills-OIS spread</td>
<td>.829**</td>
<td>.698**</td>
<td>.583**</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: *** indicates statistical significance at the 1% level.
To construct the uncertainty index, the Principal Component Analysis (PCA) is used. PCA is a way of identifying patterns in data and expressing the data in a way which highlights their similarities and differences.

Using PCA, identify patterns in the 4 variables and extract a single variable, called a principal component (i.e., uncertainty index).
Uncertainty index: Results

- S&P/ASX 200 VIX: 0.94
- Dispersion: 0.89
- Credit spread: 0.77
- Bills-OIS spread: 0.89

Correlation of individual uncertainty proxies with the index
Uncertainty Index: Application

- The uncertainty index will be used in Stage 2 of our WACC framework.

- WACC decision rule:
  - If the uncertainty index is within or at 1 standard deviation from the long-term average of 0, we will select the midpoint WACC.
  - If it is not, we will consider deviating from the midpoint WACC.
  - In deciding whether and by how much the WACC point estimate should deviate from the midpoint WACC, we will have regard to the value of the uncertainty index and additional financial market information.
The uncertainty index has a mean of 0 and a standard deviation of 1.

Our decision rule implies that if the value of the uncertainty index is within ±1, we will choose the midpoint WACC. About the 20% of the total monthly observations is outside ±1.
Uncertainty index versus confidence indices

- Westpac-MI consumer confidence index: a measure of optimism that consumers feel about the overall state of the economy and their personal financial situation.

- NAB Business confidence index: a measure of optimism that businesses feel about the overall state of the economy through their activities of investing and spending.
Uncertainty index and implied MRPs

![Graph showing Implied MRPs based on Damodaran (2013) and Uncertainty Index with data points from 2001 to 2013. The graph compares the two indices over time, with peaks and troughs indicating periods of higher and lower uncertainty and implied MRPs.](image-url)