

Risk Tolerances for Quasi Syndicates And Publicly-held Firms

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Questions:

1. Is it reasonable to think about a firm risk attitude?
2. If so, is it possible to estimate this risk attitude from available market information?

Foundations for what we did:

Wilson (1968) developed the idea of a risk tolerance for a group of investors in a common project - for a “syndicate”.

- ◆ Exponential Utility functions
- ◆ Risk sharing arrangements a function of risk tolerances

Lintner’s (1970) formulation of the investor decision problem.

- ◆ Investor valuations of their holdings
- ◆ Market price of risk as a function of the sum of investor risk tolerances

Foundations:

Levy (1979) derived a version of the CAPM (GCAPM) in the context of more than one investor portfolio.

The work of Decision Analysis researchers:

- ◆ Spetzler (1968)
- ◆ Howard (1986)
- ◆ Walls and Dyer (1996)

From the Decision Analysts we get the idea of a firm risk tolerance

From finance we got the formulation and the notion of market equilibrium when there are many investment portfolios in said market

From Wilson we got the idea of aggregation of investor risk tolerances within *quasi-syndicates*, which are defined according to the distribution of assets - not investors - across portfolios.

Formulation:

$$\underset{V_{ik}}{\text{MAX}} \hat{P}_i | V_{P_i} = \left(\sum_{k=1}^K V_{ik} (1 + ER_k) - .5c_i \tilde{\mathbf{S}}_{P_i}^2 \right) (1 + r_f)^{-1} + V_{if}$$

$$\text{ST} \quad \sum_{k=1}^K V_{ik} + V_{if} = V_{P_i}$$

where

$$\tilde{\mathbf{S}}_{P_i}^2 = \sum_{k=1}^K \left(V_{ik}^2 \mathbf{s}_k^2 + 2 \sum_{h>k} \mathbf{r}_{hk} V_{ik} V_{ih} \mathbf{s}_k \mathbf{s}_h \right)$$

Individual Asset Valuations

$$V_{ik} = (ER_k - r_f) c_i^{-1} \mathbf{s}_k^{-2} - \sum_{h \neq k} \mathbf{r}_{hk} V_{ih} \mathbf{s}_h \mathbf{s}_k^{-1}$$

and Variances

$$\mathbf{d}_{ik}^2 = \mathbf{s}_k^2 + \sum_{h \neq k} \mathbf{r}_{hk} V_{ih} V_{ik}^{-1} \mathbf{s}_h \mathbf{s}_k$$

Market Variance

$$\mathbf{s}_{km}^2 = \mathbf{s}_k^2 + \mathbf{s}_k V_k^{-1} \sum_{i \in I_k} \sum_{h \neq k} \mathbf{r}_{hk} V_{ih} \mathbf{s}_h$$

Results:

We looked at the 15 of the same firms analyzed by Walls and Dyer (1996). We estimated the firm risk tolerance from the following equation:

$$c_k^{-1} = V_k \mathbf{s}_{km}^2 (ER_k - r_f)^{-1}$$

A key issue is estimation of the unobservable \mathbf{s}_{km}^2 , with

$$\mathbf{s}_{km}^2 = \mathbf{s}_k^2 + \mathbf{s}_k V_k^{-1} \sum_{i \in I_k} \sum_{h \neq k} r_{hk} V_{ih} \mathbf{s}_h$$

We refer to \mathbf{s}_{km}^2 as the firm's "market" variance, since it contains correlation and specific investor valuation information.

We need to estimate \mathbf{s}_{km}^2 to get our firm risk tolerances.

In our paper, we used the variance of firm historical returns to estimate \mathbf{s}_{km}^2 .

Risk Tolerances for 15 Energy Firms 1983 - 1995

