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A Holistic View of Small Stock Premiums

History, Literature & Practice

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The Size Effect

Size Effect, Size Premium, Small Stock Premium

- "Size effect" refers to differences in risk-adjusted equity returns observed across different business sizes (actual returns in excess of those predicted by CAPM).

- The size effect continues to be observed, even if the "size premium" or "small stock premium" (i.e., the abnormal returns of small stocks relative to large stocks) has diminished or reversed over certain periods.

- Hundreds of studies have been conducted over ~30 years on the size effect and the small stock premium, across various geographies, markets, industries, and time periods (although generally, a long time horizon is utilized for observation).

Note: This presentation is meant to convey general trends, views, and commonly-accepted approaches to estimating excess returns arising from factors relating to size. It is not meant to be an exhaustive or authoritative review of the size premium.

Early Days: The Pricing & Efficiency of Markets

Market Inefficiency or Model Misspecification?

- The Capital Asset Pricing Model (CAPM) was introduced in the early/mid-1960s, by Treynor, Sharpe, Lintner, and Mossin, built upon the earlier work of Markowitz.

- Around this same time period (mid-1960s), the efficient markets hypothesis (EMH), in a more developed form, began to take hold, built upon the work of Samuelson and Fama.

- In the late-1970s, various studies began to correlate additional factors to realized returns that could be relevant to asset pricing (e.g., dividend yields, P/E ratios, etc.).

- These studies were initially used as proof that markets were inefficient (in support of CAPM, thereby disproving EMH), rather than to pointing to potential misspecifications in the pricing model (in support of EMH, thereby disproving CAPM).

Initial Identification of the Size Effect: Process

Banz's Study

- As part of his dissertation at the University of Chicago, Rolf Banz reviewed common stock returns and found that small firms had (on average) higher risk-adjusted returns than large firms, which he coined the "size effect" in his 1981 study.

- In Banz's study, NYSE common stocks were assigned to 1 of 25 portfolios (ranked 1-5 on size and beta), reviewed over 7 periods (1 forty-year, two 20-year, and four 10-year periods) between 1936 and 1975.

- Banz's dissertation committee included a number of notable scholars, including Myron Scholes (Chair), John Gould, Roger Ibbotson, Jonathan Ingersoll, Eugene Fama (considered the father of modern EMH), and Merton Miller.

Initial Identification of the Size Effect: Conclusions

Banz's Conclusions

- Banz concluded that due to the longevity of the size effect, excess returns were likely due to the fact that the linear model (CAPM) was misspecified, and that market efficiency holds.

- The size effect was most pronounced for the smallest firms in the sample, although Banz stated that there was no theoretical foundation for the effect.

- Whether size itself generates alpha, or whether size is a proxy for one or more true but unknown factors correlated with size (i.e., investor estimation risk, P/E effects) was left open to debate.

- Banz cautioned that the result should not be used as the basis for a theory of mergers (i.e., large firms could discount similar cash flows of acquired firms at a smaller discount rate), as this could be "nonsense" if size were a proxy for other unknown factors.

Initial Responses to Banz's Study

[1]			
Author	**Title**	**Published**	**General Conclusion**
Reinganum	"Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings' Yields and Market Values"	1981	**Supportive of Banz's study.** Reports a significant negative relationship between abnormal returns and the market value of common equity, expanding the sample set into both NYSE and AMEX common stocks.
Roll	"A Possible Explanation of the Small Firm Effect"	1981	**Effect is Due to Improper Risk Measurement.** Contended that the size effect arises from trading frequency, which underestimates the beta of infrequently-traded shares and overestimates the beta of frequently-traded shares.
Reinganum	"A Direct Test of Roll's Conjecture on the Firm Size Effect"	1982	**Roll's Hypothesis Does Not Explain the Size Effect.** Tests Roll's hypothesis with adjusted betas, and confirms that excess returns are still not explained by Roll's conjecture.
Brown, Kleidon, and Marsh	"New Evidence on the Nature of Size-Related Anomalies in Stock Prices"	1983	**Effect is Non-Stationary and Subject to Reversal.** Reports a reversal of the size premium in certain years, rejects that the premium is stationary year-over-year, and notes that part of the size effect may be explained by an omitted risk factor.
Stoll and Whaley	"Transaction Costs and the Small Firm Effect"	1983	**Effect is Due to Trading Costs.** Contend that transaction costs explain the size effect, as these costs prevent arbitrageurs from eliminating the average return differential.
Keim	'Size-Related Anomalies and Stock Return Seasonality: Further Empirical Evidence"	1983	**Effect is Primarily Due to January Returns.** Using NYSE and AMEX common stock data, finds that 50% of the average "size effect" over 1963-1979 arises from January abnormal returns, of which over 50% is observed in the first week of trading in the year. Contends that the premium is unlikely to be due to trading costs as Stoll and Whaley propose, as these costs are not subject to seasonality.
[1] This list represents a sample of initial responses to Banz's study and is not meant to be exhaustive. Please review references and citations for a non-exhaustive list of studies and articles reviewed for this presentation.			

Size Effect: Phenomena & Hypotheses

[1]

January Effect. Approximately half of the size effect is observed in January, primarily within the first trading week, and generally within the first trading day of the year. This could be driven by tax loss harvesting or portfolio window dressing. However, it is also observed in countries where the tax year doesn't align with the calendar year (i.e., UK, Australia). Also, some portfolio managers report quarterly, and the effect isn't observed in those quarters.

Disappearance/Reversal of the Size Premium. The size effect (and value effect) generally disappeared after papers that highlighted it were published, and investing strategies implemented it (including the launch of Dimensional Fund Advisors with Fama as Director of Research in 1981). In the US, the trend weakened between 1982 and 2002. There was a notable decline in the premium in the UK and US between 1989 and 1997 with directional reversals in the annual small stock premium. However, numerous other studies continue to find an existence of the premium, including a number of countries in Europe and in the US. One issue that remains is that the premium is not impounded into current forward-looking discount rates and it is often based on "inertia."

Endogenous Factors (e.g. Illiquidity, Value Factor). Size is highly-correlated with liquidity. While this may manifest through a lack of trading frequency (which underestimates the beta of infrequently-traded shares and overestimates the beta of frequently-traded shares) adjusted betas do not explain excess returns. Market/book has been found in numerous studies to correlate strongly with excess returns, especially in emerging markets. The average daily volume of transaction in dollars (ADV) is a proposed solution to measure the size effect without the contamination associated with sorting procedures.

[1] These hypotheses, phenomena, and challenges are independently detailed and cross-referenced within numerous studies that cover various industries, markets, and geographies over various time periods. Please review references and citations for a non-exhaustive list of studies and articles reviewed for this presentation.

Size Effect: Phenomena & Hypotheses

[1]

Exogenous Factors (e.g. Consumer Sentiment, Transaction Costs, Momentum). Returns and size have been found to have zero/negative correlation to the book value of assets or PP&E, sales, or the number of employees (controlling for firm value). Size has also been found to be negatively correlated with consumer sentiment. Additionally, trend factors relating to recent returns offer valid explanations (i.e., momentum or contrarian strategies). Fama and French have noted that momentum remains an issue. Higher transaction costs and bid-ask spreads may limit the activity of arbitrageurs.

Statistical Biases & Errors (i.e., Survivorship, Data Mining, Poor Sorting). Rates of return are contingent upon survival, and small, underperforming firms are more likely to delist from exchanges than small high-performing firms, or large firms (under- or over-performing). Exchange survival rates continue to increase for component companies over time. Excess returns in larger deciles lack statistical significance, especially when using a sorting (rather than regression) methodology. Additionally, authors tend to publish "surprising" conclusions. A size effect is not surprising as two firms with the exact cash flows but different discount rates will naturally diverge in size.

Concentrated in Smallest Companies. When extreme returns and very small firms (<$5 million market capitalization) are removed (domestically and internationally) the difference in returns is largely eliminated in some studies (observed within numerous emerging markets and in the US). Size is also statistically insignificant if firms with market values <$5 million are removed. Fama and French found the size effect is five times larger in firms in the 20th percentile (using NYSE data) and marginal across larger firms.

Concentrated in "Junk". Evidence showing the variability of size effect is driven by the volatility and performance of small, low-quality firms, (defined in terms of profit, profit growth, earnings, payouts, investments, tec.) which should be removed from the data set. After removal, a monotonic size premium emerges, and a number of challenges to the size premium are explained (i.e., significance, variability, small company concentration, seasonality, model misspecifications, illiquidity, and international stability).

[1] These hypotheses, phenomena, and challenges are independently detailed and cross-referenced within numerous studies that cover various industries, markets, and geographies over various time periods. Please review references and citations for a non-exhaustive list of studies and articles reviewed for this presentation.

Discount Rate Considerations (Operating View)

- Should small, well-performing firms with stable growth and consistent cash flow yields be penalized simply for being smaller?

- When operating returns are stable in context of a Gordon Growth Model, what does a size premium capture?

Gordon Growth Model
$g \quad + \quad \dfrac{D_1}{P_0}$

g	=	growth rate in stock return
D_1	=	Forward looking dividend/cash flow
P_0	=	Stock price today

Discount Rate Considerations (Financing View)

- What makes size systematic and other factors diversifiable (e.g., momentum, value)?

- Excess returns due entirely to size? Cross-effects/contamination?

Security Market Line (SML, CAPM)

$$R_f + \beta_s (R_m - R_f)$$

$$= \rho_{s,m} \frac{\sigma_s}{\sigma_m}$$

R_f	=	risk-free rate of return
R_m	=	return on market portfolio
β_p	=	stock beta
σ_m	=	standard deviation of market return
σ_p	=	standard deviation of stock return
$\rho_{p,m}$	=	stock return and market return correlation

CAPM, Expanded

$$R_f + \rho_{s,m} \frac{\sigma_s}{\sigma_m} (R_m - R_f)$$

Capital Market Line (CML)

$$R_f + \frac{\sigma_s}{\sigma_m} (R_m - R_f)$$

Difference in pricing a stock added to a diversified portfolio (CAPM, SML, β) vs. on a standalone basis (CML, σ) relates to correlation (ρ).

Size Effect & Small Stock Premium: Observations

- While no study or paper ultimately proves or disproves the size effect, the effect continues to be observed internationally. However, the literature provides unstable outcomes, depending upon:

  - **Who** measures it;

  - **How** they measure it;

  - **Where** they measure it; and

  - **When**, or over what time period where they measure it.

- **What** is driving the effect when it is observed?

  - Banz: *"we do not even know whether the factor is size itself of whether size is just a proxy for one or more true but unknown factors correlated with size."*

  - Fama and French: three factor model is *"hardly a panacea."*

Size Effect & Small Stock Premium: Continued Existence

- **Does** the size premium still exist and **should** it always be included?

  - Forward-looking risk premia, relying on market prices and forecasted cash flows to determine expected returns, do not embed a size premium.

  - The calculated premium could differ based on the selected lookback period.

  - Risks could be adjusted for within forecasted cash flows rather than in the discount rate.

  - Should small, well-performing companies face an increased cost of capital due only to size (if size remains a priced factor after controlling for distress, leverage, etc.)?

  - A size premium, if applied, should be justified, company-specific, and not merely applied based on past or mechanical processes (specialist inertia).

Common Measurement Methods

Market Capitalization

- Frequently used in practice; default measurement method.

- Long lookback periods, accessible data, numerous reliable data points (i.e., CSRP, Ibbotson, Morningstar, Duff & Phelps, BVR).

- Poor performance, impaired financial condition, limited volume (especially in smaller deciles) can undermine the validity of the calculated premium.

- Distortion in beta may arise (especially in mid-capitalization stocks), as volatility decreases and correlation increases with capitalization.

- Companies with limited market values may have other characteristics correlated with size (i.e., start-ups, leverage, poor performance).

- Smaller deciles may be impacted by larger companies falling into smaller deciles ("fallen angels") due to leverage or other factors (e.g., Xerox, United Airlines).

Common Measurement Methods

Market Capitalization

- Controlling for poor performance or company-specific factors (sales, earnings, operating history, leverage, etc.) may enhance and support the validity of the premium.

- Screening processes, undertaken by AQR Capital Management (in the *Journal of Financial Economics)* and Duff & Phelps (in the *Risk Premium Report)* which remove a number of company-specific factors associated with a lack of quality, generally result in monotonicity across size deciles.

Average Daily Volume (ADV)

- Total amount of daily traded dollars in a traded stock.

- Not frequently used in practice; limited data and studies available.

Common Measurement Methods

Average Daily Volume (ADV)

- Limited use when valuing non-public entities.

- Supported by arguments that the size effect may be a liquidity risk premium, and that difficult to liquidate stocks are often traded at a discount.

- Extreme drawdown frequencies, which may produce higher moments of return distributions (kurtosis, downside probabilities), are more frequently associated with smaller stocks and lower volume, that could result in a non-conventional risk premium.

Alternative Measures

- Metrics such as market value of invested capital, sales, book value of equity, average earnings, number of employees.

- Less-frequently used in practice.

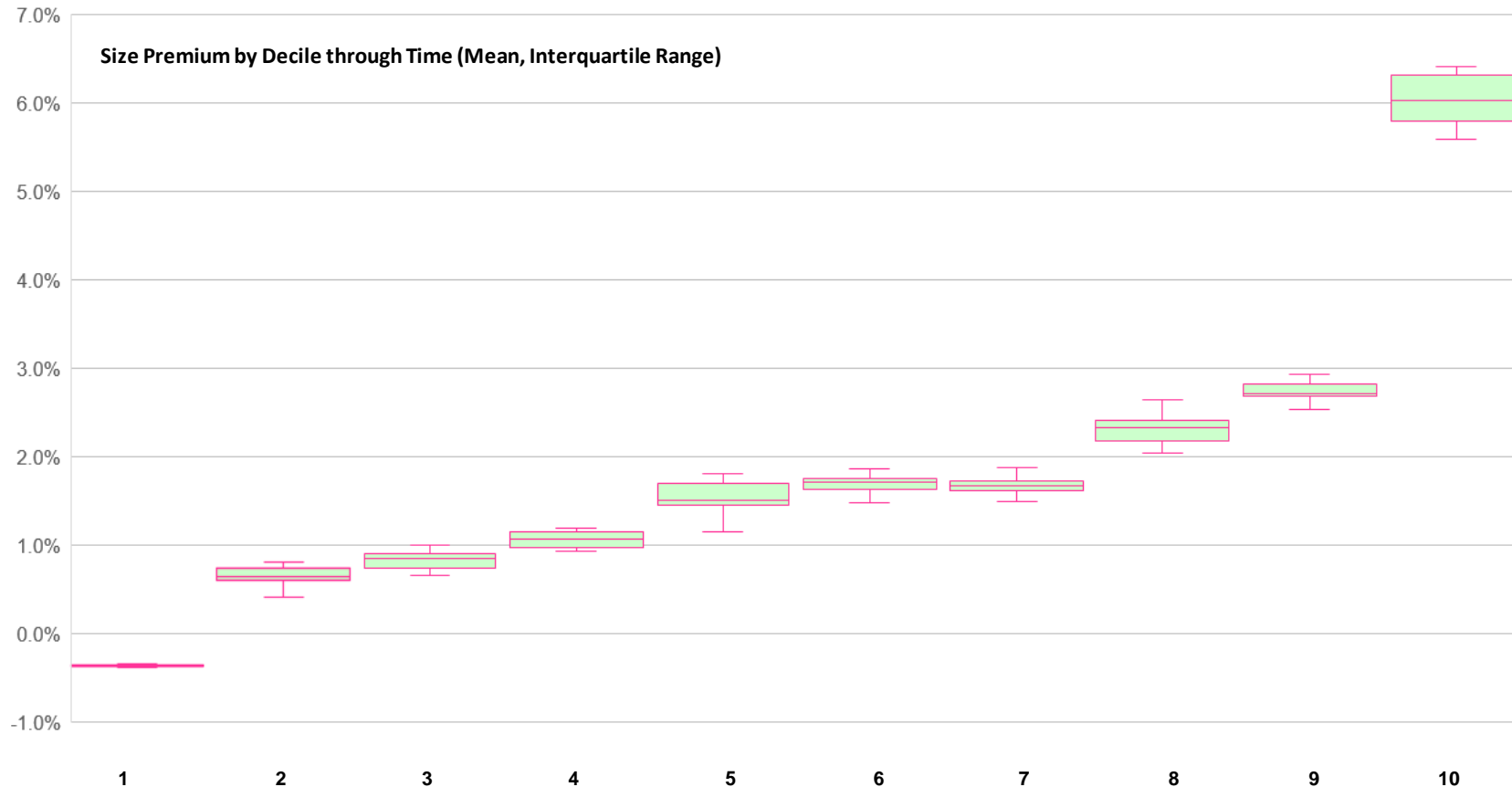# Common Measurement Methods

Alternative Measures

- Metrics such as market value of invested capital, sales, book value of equity, average earnings, number of employees.

- Generally accessible through data or regression equations supporting premia (*Risk Premium Report*).

- Lacks theoretical basis. Some studies have failed to find a statistically significant relationship between average returns and other measures of firm size (i.e., assets, revenue, fixed assets, number of employees).

Studies & Measurements

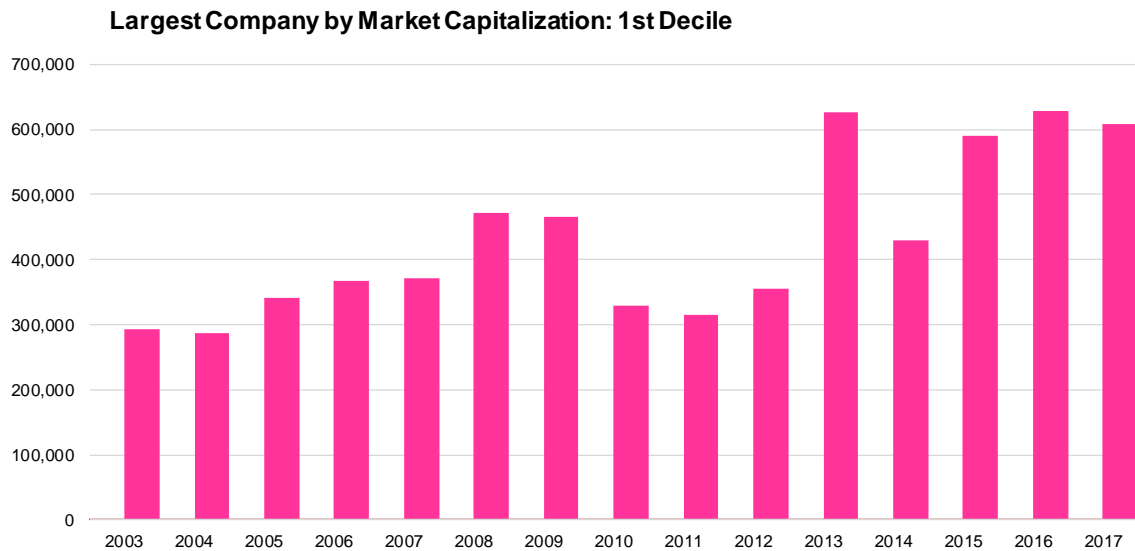**Ibbotson/Morningstar/Duff & Phelps Risk Premium Studies:** *stable premia.*

Source: 2003-2017 Risk Premium Studies (Ibbotson, Morningstar, and Duff & Phelps)

Size Premium by Decile through Time (Mean, Interquartile Range)

Studies & Measurements

Ibbotson/Morningstar/Duff & Phelps Risk Premium Studies: *time series analysis of largest market capitalization of 1st and 10th decile firms.*

Largest Company by Market Capitalization: 1st Decile

**Largest Company by Market Capitalization: 10th Decile**
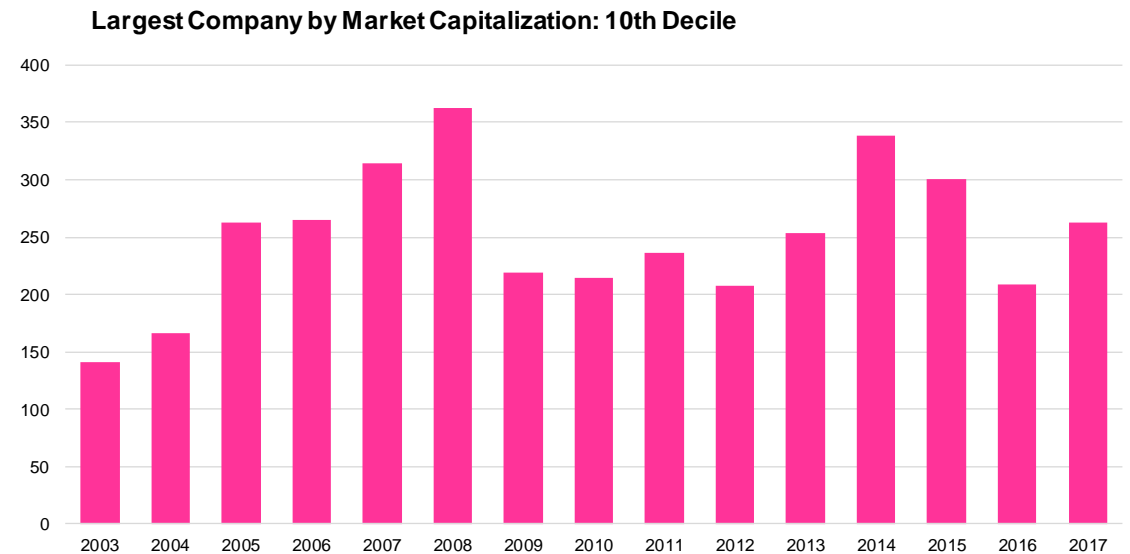
Studies & Measurements

Controlling for Quality/Junk Study: *monotonic premium arises after controlling for quality/junk (i.e., profitability, growth, safety).*

Size Matters, If You Control Your Junk Study

July 1957 through December 2012		Size Decile Alphas (Monthly)									
		Small	2	3	4	5	6	7	8	9	Big
FF Factors	[1]	0.2%	0.1%	0.2%	0.1%	0.2%	0.1%	0.1%	0.1%	0.0%	0.0%
FF Factors, Augmented	[2]	0.7%	0.5%	0.5%	0.4%	0.4%	0.3%	0.2%	0.2%	0.1%	-0.1%

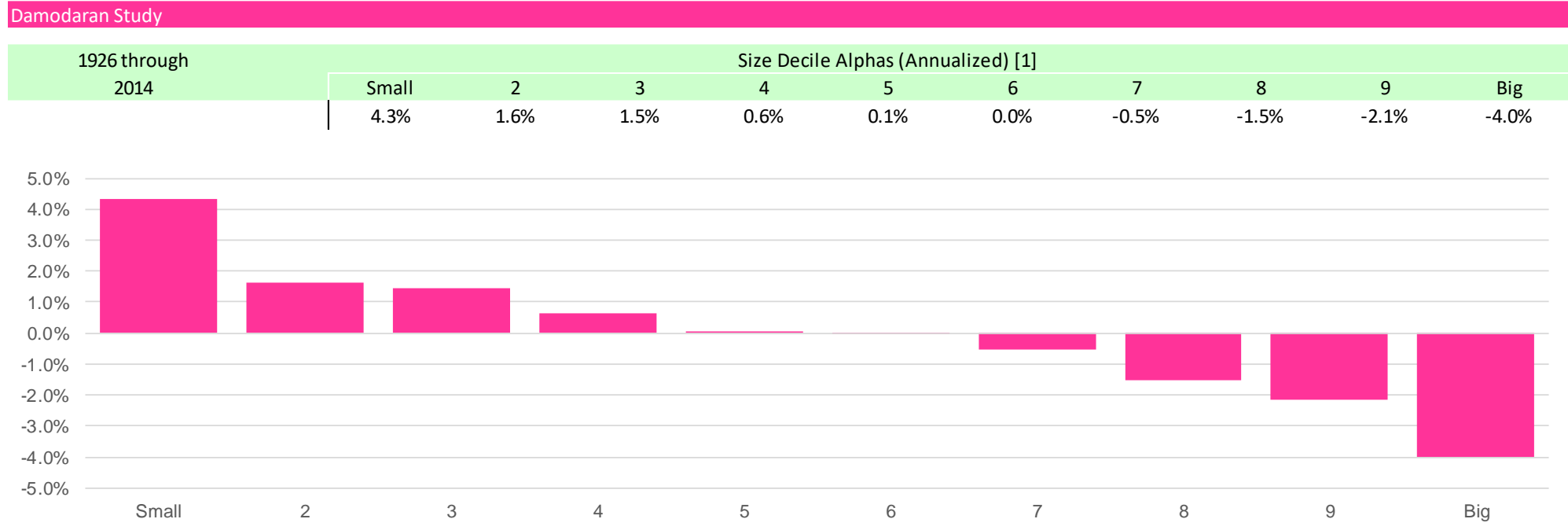| July 1957 through December 2012		Size Decile Alphas (Annualized)									
		Small	2	3	4	5	6	7	8	9	Big
FF Factors	[3]	2.3%	1.4%	2.4%	1.4%	2.2%	1.4%	1.3%	1.3%	0.5%	-0.2%
FF Factors, Augmented	[3]	8.3%	6.5%	6.1%	4.7%	4.9%	3.5%	2.8%	2.5%	1.1%	-1.4%
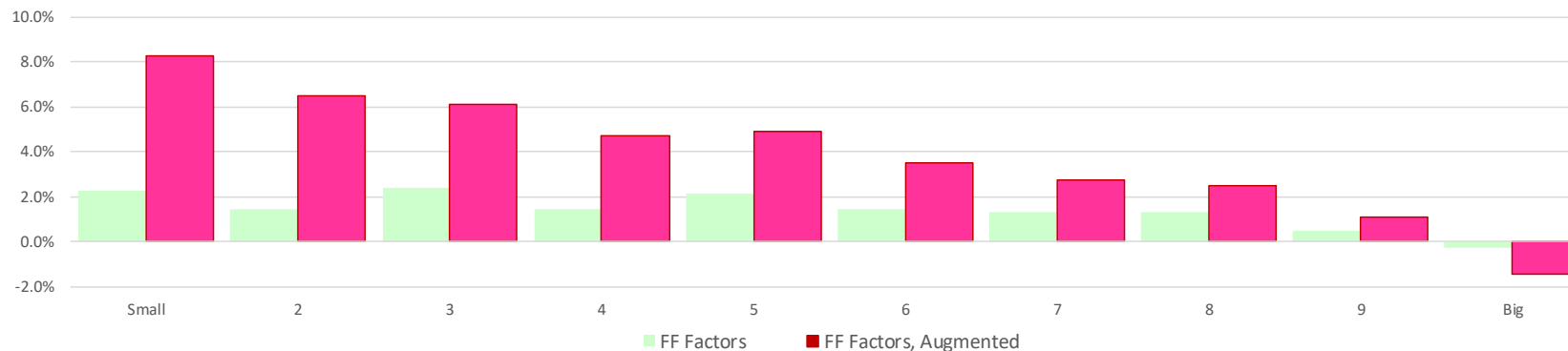
[1] Alphas of each size decile are plotted with respect to the Fama and French market return (RMRF), RMRF lagged a month, high minus low (HML), and up minus down (UMD) factors.

[2] Represents same factors as in [1] above, augmented with the quality factor, QMJ, from Asness et al. (2014) .

[3] Annualized by multiplying monthly returns (does not assume compounding for simplicity).

Studies & Measurements

Damodaran Study: *intact premium over long periods of time, but subject to high standard error.*

Damodaran Study										
1926 through	Size Decile Alphas (Annualized) [1]									
2014	**Small**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Big**
	4.3%	1.6%	1.5%	0.6%	0.1%	0.0%	-0.5%	-1.5%	-2.1%	-4.0%

[1] Damodaran size deciles are presented in ascending order by size (as opposed to descending order by size for most other studies).

Studies & Measurements

Robustness of Size and Value Effects in Emerging Markets: *significant size premium was observed in emerging markets from 1985 to 2000, but was concentrated in small number of "extreme" returns.*

- Excluding outliers, an annualized size premium of ~6%-7% was observed for the smallest companies.

Robustness of Size and Value Effects in Emerging Markets

Size Quintiles								
1985 to 2000		Small	2	3	4	Large	T-Stat	% of Months Small > Big
Average Returns (All Data)		2.9%	2.2%	1.8%	1.4%	0.7%	4.42	63.4%
Premium over Large (Monthly- All Data)	[1]	2.2%	1.4%	1.1%	0.6%	0.0%		
Premium over Large (Annual - All Data)	[2]	26.4%	17.3%	12.6%	7.5%	0.0%		

Size Decile Alphas (Annualized)								
1985 to 2000		Small	2	3	4	5	T-Stat	% of Months Small > Big
Average Returns (Excl. Outliers)		1.4%	1.6%	1.4%	1.3%	0.9%	1.8	56.5%
Premium over Large (Monthly - Excl. Outliers)	[1]	0.5%	0.7%	0.5%	0.4%	0.0%		
Premium over Large (Annual - Excl. Outliers)	[2]	6.4%	8.3%	6.0%	5.1%	0.0%		
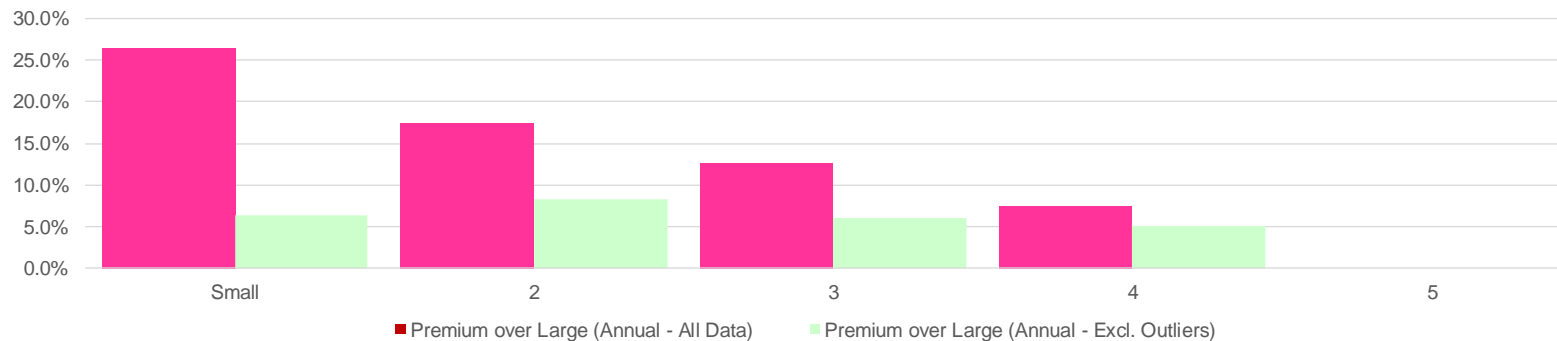
[1] Calculated as the return of each smaller quintile over the return on the largest decile.
[2] Annualized by multiplying monthly returns (does not assume compounding for simplicity).

Final Thoughts

- Analyst judgment and thoughtfulness should supersede mechanically-applied premia (whether equity risk premium, country-risk premium, or size premium).

- Data sources for risk premia may be considered, but logic should dictate the amount and directionality of the adjustment.

- Risks should be commensurate in context of both the expected cash flows and the discount rate.

- Attributes of small, well-performing companies should be considered before broadly applying a premium due to size.

- Premium should be justified, company-specific, and not merely applied based on specialist past practice.

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