Geometric Average Capitalization

Introduction

Morningstar replaced median market capitalization with geometric average capitalization as a measure of the overall "size" of a mutual fund's portfolio effective June 30, 2003. This data point is available for open-end funds, closed-end funds, variable annuity underlying funds, separate accounts, and exchange-traded funds that invest in domestic and foreign stocks.

Geometric average capitalization measures the average size of a fund's U.S. and non-U.S. stock holdings. While market capitalization (stock price times the number of shares outstanding) is the industry standard for determining the size of a stock, there are various ways to calculate a comparable value for mutual funds. Previously, Morningstar calculated median market capitalization; Morningstar trimmed the largest and smallest stocks in each fund's portfolio and then asset-weighted the market caps of the remaining stocks.

Median market capitalization was not always representative of the fund's full investment style, because 80% of the fund's assets were trimmed and the average was based on the remaining 20% of assets. This method prevented extreme outliers (e.g. a giant-cap stock like Microsoft) from skewing the result, but it sometimes underestimated or overestimated the average size of the fund's holdings.

Geometric average capitalization solves this problem, because it uses the market caps of all the stocks in the fund and does so in a way that is less prone to skewing. This measure better identifies the fund's "center of gravity," which can help investors understand how market trends (related to capitalization levels) might affect their portfolio.

In some cases, geometric average capitalization will be very close in value to median market capitalization. Differences between the two values will be most apparent for those funds that invest in stocks of all sizes.

When a fund owns stocks from only one of the seven style zones (US, Canada, Latin America, Europe, Japan, Australia/NZ, and Asia ex-Japan), the geometric average capitalization of the fund can be compared to the large-, mid-, and small-cap divisions of the Morningstar Style Box™. In these cases, the Style Box size score (raw y) is derived from the natural logarithm of the geometric average capitalization of the stocks in the fund's portfolio[1]. This relationship does not hold when a fund owns stocks from several style zones, because the market cap breakpoints for each style zone are different.

What It Means for Investors

It is important for investors to have a consistent measure of the average size of a fund's holdings. Because large-cap stocks often perform quite differently than mid-cap or small-cap stocks, many investors diversify between size classes, for example, pairing an S&P500 index fund (large-cap) with a small-cap fund.

Geometric average capitalization can help an investor differentiate between funds that fall in the same Morningstar Category™. This can be helpful when investors are searching for a new fund. For example, Merrill Lynch Fundamental Growth Fund and Merrill Lynch Large Cap Growth Fund are both in the Large Growth category, but they have different investment approaches, as evidenced by their values for geometric average capitalization—$33.1 billion and $10.3 billion, respectively[2]. Both funds invest in some of the largest stocks available, but Merrill Lynch Large Cap Growth also invests a considerable portion of assets in mid-cap stocks. The geometric average capitalization helps expose different investing styles so that investors can understand exactly what the fund owns.

Geometric average capitalization is also helpful for monitoring "size drift," which is movement of the fund along the size axis of the Style Box. An investor who has purposefully selected a fund for its specific investing style would want to know if that portfolio manager started to position the fund outside of that range. For example, if a small-cap manager holds stocks that have appreciated in price (and subsequently market cap), the fund could drift into mid-cap territory. Investors can monitor size drift with geometric average capitalization, which is recalculated monthly for all funds using updated values for stock market cap.

---

[1] The use of geometric average capitalization to determine a fund's y score is equivalent to asset-weighting the y scores of the individual stocks. For more detail about the Morningstar Style Box for domestic equities, please see "The Morningstar Style Box Methodology" at http://datalab.morningstar.com/midas/home/DL_Homepage.asp.

[2] All examples are based on 4/30/2003 stock data and the fund holdings from the most recent portfolio available at the time of the calculation.

Geometric Average Capitalization vs. Median Market Capitalization

For many funds, geometric average capitalization is very close in value to median market capitalization.
For example,

	Geometric Avg Capitalization	Median Market Capitalization
Merrill Lynch Fundamental Growth	$33.2 billion	$33.5 billion
Brown Capital Management Small Company Fund	$511.5 million	$557.0 million

For other funds, there will be differences. The improved methodology of geometric average capitalization
is most revealing for funds that invest across multiple size classes. For example, Merrill Lynch Large Cap
Growth Fund, which invests in both mid- and large-cap stocks, has a geometric average capitalization of
$10.3 billion and a median market capitalization of $5.9 billion. With a large-mid domestic Style Box
breakpoint of $8.3 billion (as of 4/30/2003), these two values tell very different stories; geometric average
capitalization is above the mid-large breakpoint while median market capitalization is below that
breakpoint. This fund's median market capitalization understates the fund's exposure to very large stocks
like General Electric, Microsoft, Wal-Mart, and Pfizer (all of which have market caps greater than $189
billion). The geometric average capitalization better represents the fund's mix of large- and mid-cap stocks.
Appendix A shows the holdings for the fund and the relative placement of these two values.

Appendix B shows the holdings of Fidelity Select Multimedia, where median market capitalization skews
the average in the other direction. This fund's median market capitalization of $12.5 billion overstates the
large-cap holdings of the fund, where the top seven holdings represent 46% of the assets. The fund's
geometric average capitalization is $6.8 billion, which better reflects the fund's mix of investments,
including 44% of assets in mid- and small-cap stocks.

Methodology

The geometric average capitalization for a fund is the geometric mean of the market caps of all the stocks
in the portfolio. It is calculated by raising the market cap of each stock to a power equal to that stock's
weight in the portfolio. The resulting numbers are multiplied to produce the geometric average
capitalization.

First determine the weight of each common stock or equivalent in the fund:

$$W_{pf} = \frac{MV_{pf}}{MV_f} \qquad\qquad (1)$$

where

W_{pf} = the month-end weight of stock p in fund f

MV_{pf} = month-end market value of stock p in fund f

MV_f = month-end total market value of all U.S. and non-U.S.[3] common stocks and equivalents in fund f

All the weights should sum up to 1, that is

$$\sum W_{pf} = 1$$

(2)

The geometric average capitalization of the fund is calculated as follows:

$$GAC_f = \prod_{p=1}^{n} C_p^{W_{pf}}$$

(3)

where

GAC_f = geometric average capitalization of fund f

C_p = month-end market cap of stock p

n = month-end number of common stocks and equivalents in fund f

For example, given a fund with the following portfolio and the following market caps for each stock:

	Market Value	Percent, W_{pf}	Market Cap ($M), C_p
Procter & Gamble	$ 56,000	40%	115,800
General Electric	$ 35,000	25%	289,700
Dean Foods	$ 35,000	25%	3,900
Ford	$ 14,000	10%	19,100

The geometric average capitalization is:

($115.8 billion$^{0.4}$) *($289.7 billion$^{0.25}$) * ($3.9 billion$^{0.25}$) * ($19.1 billion$^{0.1}$)

= $52.1 billion

The methodology for geometric average capitalization can also be easily applied to a portfolio of both individual stocks and mutual funds.

---

[3] Median market capitalization was also based on both U.S. and non-U.S. stocks for all funds.

Conclusion

Geometric average capitalization is an enhanced measure of the size of a fund's holdings, and it provides a better estimate of the fund's average size than median market capitalization. Investors can use this value to position the fund in relation to its category peers and to plot its exact position inside the Morningstar Style Box. Geometric average capitalization can also help an investor select an appropriate fund for their investing needs or monitor their fund for size drift.

Appendix A: Merrill Lynch Large Cap Growth Fund

Ticker	Security Name	% Assets	Mkt Cap
GE	General Elec	4.10%	293,613
MSFT	Microsoft	3.42%	273,527
WMT	Wal-Mart Stores	1.39%	248,594
PFE	Pfizer	2.77%	189,482
JNJ	Johnson & Johnson	2.16%	167,293
MRK	Merck	2.80%	130,613
INTC	Intel	0.77%	120,783
CSCO	Cisco Sys	0.52%	107,250
DELL	Dell Comp	2.45%	74,745
FNM	Fannie Mae	2.51%	71,594
ORCL	Oracle	2.05%	62,275
EBAY	EBAY	1.28%	25,760
QCOM	Qualcomm	1.62%	25,150
FRX	Forest Labs	1.56%	20,587
BSX	Boston Scientific	1.20%	17,710
GIS	General Mills	1.24%	16,600
AWE	AT&T Wireless Svc	1.26%	14,877
NXTL	Nextel Comms Cl A	1.24%	14,819
GPS	Gap	1.18%	14,756
SYK	Stryker	1.18%	13,275
WLP	WellPoint Health Networks	1.32%	11,167
APOL	Apollo Grp Cl A	1.11%	10,250
MAT	Mattel	1.23%	9,506
LXK	Lexmark Intl	1.27%	9,403
SPLS	Staples	1.18%	9,008
CCE	Coca-Cola Enterprises	1.03%	8,765
INTU	Intuit	0.89%	7,985
IGT	Intl Game Tech	1.18%	7,481
AZO	AutoZone	1.11%	7,441
HRB	H & R Block	1.23%	6,917
SYMC	Symantec	1.13%	6,429
ACS	Affiliated Comp Svcs A	1.11%	6,322
AN	Autonation	0.62%	4,619
BEAS	BEA Sys	0.99%	4,392
LEN	Lennar	0.98%	3,874
COH	Coach	1.13%	3,834
EXPD	Expeditors Intl of WA	1.08%	3,791
NYB	New York Comm Bancorp	1.08%	3,669
BRL	Barr Labs	1.05%	3,668
VAR	Varian Medical Sys	1.14%	3,655
PCS	Sprint (PCS Group)	1.09%	3,497
BMC	BMC Software	1.07%	3,481
DHI	DR Horton	0.85%	3,473
WFMI	Whole Foods Market	1.05%	3,461
IRM	Iron Mountain	0.79%	3,381
UIS	Unisys	1.01%	3,328
XTO	Cross Timbers Oil	1.06%	3,301
ANF	Abercrombie & Fitch Cl A	1.14%	3,198
BLL	Ball	1.02%	3,187
WPI	Watson Pharmaceuticals	1.07%	3,107
KG	King Pharmaceuticals	0.41%	3,036
…	… (25 addtl stocks)	…	…
APPB	Applebee's Intl	1.06%	1,513
HU	Hudson United Bancorp	1.03%	1,501
PPDI	Pharmaceutical Product Dev	0.96%	1,452
DVA	Davita	0.99%	1,251
SY	Sybase	0.98%	1,220
MACR	Macromedia	0.55%	767

Top 40%

Geometric Average Capitalization $10,298 million

Median Market Capitalization $5,930 million

Middle 20%

Bottom 40%

Appendix B: Fidelity Select Multimedia Fund

Ticker	Security Name	% Assets	Mkt Cap
VIA.B	Viacom Cl B	7.75%	75,820
AOL	AOL Time Warner	6.40%	58,892
NWS	News ADR	5.82%	33,601
L	Liberty Media	5.92%	28,440
CCU	Clear Channel Comms	8.72%	23,978
FOX	Fox Entrtnmt Grp Cl A	2.21%	22,858
YHOO	Yahoo	9.57%	14,735
DISH	EchoStar Comms	2.25%	14,405
USAI	USA Networks	3.27%	13,487
OMC	Omnicom Grp	4.07%	12,293
MHP	McGraw-Hill	0.26%	11,201
IGT	Intl Game Tech	0.10%	7,481
UVN	Univision Comms A	2.74%	6,907
00D3Y	VNU	0.03%	6,675
SSP	EW Scripps Cl A	2.42%	6,343
CVC	Cablevision Sys A	2.64%	6,281
X6123	Television Francaise 1-TF1	0.57%	6,111
TV	Grupo Televisa (Part) ADR	0.37%	4,688
LAMR	Lamar Advertising Cl A	1.00%	3,637
X8857	Emap	0.10%	3,281
BLC	Belo	0.37%	2,538
ETM	Entercom Comms	1.13%	2,204
XX130	Trinity Mirror	0.13%	2,020
GYI	Getty Images	1.21%	1,824
ROIA	Radio One Cl D	4.62%	1,455
VCI	Valassis Comms	0.29%	1,383
TVL	LIN TV	0.20%	1,087
CMLS	Cumulus Media Cl A	2.74%	1,082
EMMS	Emmis Broadcstg Cl A	1.04%	1,018
EVC	Entravision Comms	0.45%	914
SBGI	Sinclair Broadcast Grp	0.36%	907
BN	Banta	0.24%	784
00JK2	Astral Comm Cl A	5.29%	757
TOM	Tommy Hilfiger	0.11%	745
OVER	Overture Svcs	8.75%	634
SALM	Salem Comm Cl A	0.41%	496
SBSA	Spanish Broadcstg Sys A	0.24%	496
VCLK	ValueClick	0.44%	356
LOOK	Looksmart	0.19%	330
RGCI	Regent Comm	0.59%	279
IUSA	infoUSA B	0.10%	268
PLA	Playboy Enterprises B	1.64%	253
PRTL	Primus Telecom	0.04%	217
FWHT	FindWhat.com	0.35%	211
COVD	Covad Comms Grp	2.60%	159
RC	Grupo Radio Centro ADR	0.25%	79
SVVS	Savvis Comm	0.02%	40
DSLN	DSL.net	0.02%	24

Top 40%

Middle 20%

Bottom 40%

Median Market Capitalization $12,458 million

Geometric Average Capitalization $6,792 million