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Diversification benefits and persistence of US-based global bond funds ☆

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Abstract

This paper examines diversification benefits and performance persistence of 188 US-based global bond funds that survived and were defunct during the period of 1993–2004. Consistent with managed fund literature, global funds underperform broad-based benchmark indexes; however, the underperformance is less than the funds' expense ratio. The results using both simple and time-varying frameworks suggest that global funds provide higher total return and comparable risk-adjusted return to domestic bond funds. For US investors specializing in domestic bond funds, global funds can enhance return by 0.5–1% per year without increasing risk. Global funds also provide incremental diversification benefits to equity fund investors. The funds exhibit short-run performance persistence, but this is difficult for investors to exploit, especially in long-run. Global funds show no return seasonality during the sample period. On a risk-adjusted basis, larger and newer funds and funds with long maturity and low expense ratio perform well.

JEL classification: G11; G12; G15

Keywords: Global bond fund; International diversification; Performance persistence; Return seasonality

☆ Parts of this paper are based on the first author's Ph.D. dissertation at the University of Rhode Island. The remaining errors are the responsibility of the authors.

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1. Introduction

As of 2004, nearly half of managed bond funds in the US markets were concentrated on intermediate-term government and high-quality corporate bond funds. This subgroup is arguably representative of US bond funds because it has characteristics that fixed-income investors prefer. With the average credit quality of AA and the average maturity of 7 years, this asset class provides relatively safe investment with an intermediate-time horizon. Among the many types of bond funds currently available, global bond funds (henceforth global funds) can offer US fixed-income investors an alternative to, or an addition to, investing in US domestic bond funds, as they are comparable in quality and maturity to domestic bond funds. The similarity makes global funds a promising investment vehicle to add to an investment portfolio. Moreover, global funds provide an easy, relatively low-cost way to implement internationally diversified bond portfolios for small investors.

As the name suggests, global funds invest in worldwide bond markets, including the US bond markets. During the past 15 years, US-based global funds have grown significantly: between 1986 and 2004 the number of funds increased from 9 to 137, and net assets under management increased from $2 billion to $25.2 billion (Morningstar database). As of 2004, the market value of global funds accounted for about 3% of the value of all taxable bond funds. Global funds are expected to become more important in individual asset allocation as US baby boomers approaching retirement begin to demand more fixed-income investment in their portfolios. In addition, the extended bear equity market in early 2000s reduced investors' desire to hold equity and thus increased demand for fixed-income securities.

Despite their economic significance, global funds have received little attention in academia. In fact, the question of whether US investors can gain diversification benefits by investing in global funds still remains, at best, inconclusive.[1] Furthermore, the issues of performance persistence, the relation between fund characteristics and performance, and return seasonality of global funds have never been addressed. To date, Detzler (1999), Gallo et al. (1997) are the only published studies that have examined global funds. Detzler analyzes the performance of 19 international/global funds from 1988 to 1995, and Gallo et al. examined 22 funds during the same period. Both studies find that the funds underperform the benchmark indexes based on Jensen-alpha. Detzler also finds that the funds' alpha is negatively related to the expense ratio. She concludes that the diversification benefits might be outweighed by expenses of the funds. The conclusions of the two studies are based on the comparison of international/global funds with the benchmark indexes. However, the indexes are not investible, and their returns do not account for transaction costs.

This study evaluates performance of global funds by directly comparing risk-adjusted returns of the funds to those of comparable quality bond funds that invest only in the US markets (i.e., domestic bond funds, hereafter domestic funds). The direct comparison provides two advantages. First, unlike the indexes, both global and domestic funds are available for investors and their returns are net after transaction costs. Therefore, the transaction costs are taken into the consideration in this study. Second, the direct compar-

[1] The diversification benefits of international investment via equity funds are well established (e.g., see Bailey and Lim, 1992; Cumby and Glen, 1990; Chang et al., 1995).

ison allows us to test whether global funds can provide benefits to individual investors beyond investing only in domestic funds. In other words, this study answers whether global funds provide a better alternative or additional investment to domestic funds.

Our sample consists of 188 global and 531 domestic funds that existed or became deceased during the sample period from 1993 to 2004. Because the sample includes both surviving and non-surviving funds, the results in this study are not affected by survivorship bias. We compare performance of global funds to performance of domestic funds using both simple and conditional Sharpe ratios. The conditional Sharpe ratio allows for time-varying mean and variance. We also test whether US investors whose portfolios are concentrated on domestic bond and equity funds receive incremental benefits by adding global funds into the portfolios. To provide a comprehensive study of global funds, we further analyze performance persistence and return seasonality of global funds and the relation between fund performance and fund characteristics. To our knowledge, this study is the first to analyze performance persistence and return seasonality on global funds and the first to evaluate global funds as an alternative or additional investment for US retail investors.

The remainder of this paper is organized as follows. Section 2 details the sample selection process. Section 3 examines performance and diversification benefits of global funds. Section 4 analyzes performance persistence, return seasonality, and the relation between performance and characteristics. Section 5 summarizes and concludes the paper.

2. Sample

We create the universe of our sample by merging 10 Morningstar Principia annual CDs from 1995 to 2004. We exclude funds whose net assets at inception date or as of December 1995, whichever is later, are less than or equal to $5 million. To have sufficient returns to calculate standard deviation, we further eliminate funds with fewer than 36 monthly returns. The sample period is from January 1993–December 2004. We start the sample period in January 1993 so that funds identified in 1995 CD have at least 36 consecutive monthly returns.

2.1. Global and domestic funds

We define global funds as US-based mutual funds that invest in worldwide bond markets, including the US bond markets. From the universe, we select funds that are classified as international or worldwide bond funds by Morningstar. These include funds that invest only in foreign markets as well as those that invest in both foreign and US markets. To ensure that the funds hold both international and US bonds, we exclude the funds that do not have an investment objective of investing in worldwide bond markets, including US bond markets, and invest less than 80% of portfolio holdings in bonds and less than 40% in foreign bond markets. Further, we exclude funds whose average rating is lower than BBB. Our final sample consists of 188 US-based global funds. The average portfolio holdings of the funds are 67.69% of central government bonds, 22.72% of government agencies and ultra-large corporate bonds; the remainder is equity and cash. The average maturity of the funds is 8.25 years, with the average credit rating of AA.

For the sample of domestic funds, we select US-based bond funds from the universe that have an investment objective of investing in US government bonds of all maturities

and invest in US high-quality corporate bonds (i.e., AAA to BBB rated). These two criteria are used to find domestic funds whose portfolio holdings are comparable to the average portfolio holdings of the global fund sample. These criteria are met by 531 domestic funds. The average maturity of domestic funds is 8.05 years, with the average credit rating of AAA.

2.2. Monthly returns and fund characteristics

We obtain monthly returns of the sample from Morningstar database. Because we only have December CDs and some funds do not survive until year-end, we fill in missing return data of non-surviving funds from the CRSP Mutual Fund database.[2] The returns are total net returns in US dollars, after all administrative and trading expenses but before loads and assuming reinvestment of income and capital gain distributions. Credit quality and duration of global and domestic funds are obtained from Morningstar. The rest of fund characteristic data such as maturity, expense ratio, size, and age are obtained from both CRSP Mutual Fund and Morningstar databases.

2.3. Survivorship bias

Although Morningstar reports only funds in operation, our sample is *almost* free of survivorship bias as we select funds that appear in at least one of the ten Morningstar annual CDs. Therefore, our sample consists of both surviving and non-surviving funds. Because one of the sample selection criteria is that funds must have at least 36 monthly returns, we exclude six (3%) global funds that are defunct within 3 years, which makes our sample not completely free of survivorship bias. Elton et al. (2001) show that survivorship bias of Morningstar during 1994–1998 is minimal. Specifically, out of 375 funds, only 22 funds exhibit bias in total returns on an average of 0.86% per year or 7.16 basis points per month. However, most empirical findings show that, on average, mutual funds underperform benchmark indexes. Therefore, unless this study finds that global funds outperform the indexes and that the magnitude of the outperforming is greater than 7.16 basis points per month, the results in this study are unaffected by the survivorship bias.

Unlike most prior studies, the main objective of our analysis is to compare performance of global funds with performance of domestic funds. As mentioned previously, our sample would be free of survivorship bias if the 36-month restriction were not imposed. The 36-month restriction eliminates 6% (36) of domestic funds but only 3% (6) of global funds. Because the survivorship bias is an upward bias, the restriction might overestimate performance of domestic funds and underestimate performance of global funds. Therefore, the

[2] CRSP calculates fund returns differently from Morningstar. Elton et al. (2001) find that CRSP returns are biased upward for equity funds and the difference in returns between CRSP and Morningstar is larger for older data and smaller funds. In our sample, we find that the average difference in returns between CRSP and Morningstar is −0.0006% for global funds and −0.0001% for domestic funds, both of which are insignificantly different from zero. We also find that the return differences for both global and domestic funds in the second half of the sample period (i.e., 1999–2004) are smaller than the differences in the first half (i.e., 1993–1998). Excluding returns from CRSP does not significantly change the conclusions.

restriction biases against finding outperformance for global funds. However, we perform a robustness check and find that the restriction does not significantly affect the results.

3. Performance and diversification benefits

3.1. Performance of global funds in comparison to benchmark indexes

To complement the results of Detzler (1999), we first compare performance of global funds with world government bond indexes using both total return and Sharpe ratio. Sharpe ratio is defined as the monthly return in excess of 90-day US Treasury bills divided by standard deviation of monthly returns. The indexes include Salomon Smith Barney (SB) World Government Bond Index (SBWG), SB World Government Excluding US Index (SBWG Excl. US), and SB World Government Currency Hedged Index.

Global funds earn an average monthly return of 0.591%, comparable to 0.5975% of the hedged index, but significantly lower than the returns of both unhedged indexes (results not tabulated). The lower return of the funds compared with the returns of unhedged indexes suggests that on the return basis, global funds underperform the benchmark indexes. The average underperformance of the funds is 5.51 basis points per month or 0.66% per year. Although this amount is less than the average annual expense ratio of 1.38% that the funds in our sample charged, the underperformance still persists after adjusted for the survivorship bias of approximately 0.86% per year (Elton et al., 2001). The average standard deviation of global funds is 1.952%, twice as much as the standard deviation of the hedged index (0.9014%), but comparable to the standard deviations of both unhedged indexes.

Global funds exhibit a mean (median) Sharpe ratio of 0.1088 (0.1172), significantly lower than the mean ratios of SBWG (0.1657), SBWG Excl. US (0.1421), and the hedged index (0.3035). These findings coupled with the results presented above suggest that global funds significantly underperform benchmark indexes on the basis of both returns and risk-adjusted returns. These findings are consistent with the conclusion of Detzler (1999). The finding of the highest Sharpe ratio of the hedged index provides support to the claim that currency-hedged portfolios provide better risk-return tradeoff than unhedged portfolios (Chang et al., 1995).

3.2. Performance of global funds in comparison to domestic funds

Because the indexes are not investible and their returns do not include trading costs that investors incur if they implement the portfolios of indexes, we concentrate our performance analysis on the comparison of global funds with domestic funds. Table 1 presents average return and standard deviation of global and domestic funds. Overall, global funds provide higher return and higher risk than domestic funds. For the entire period, the average monthly return of global funds is 0.59%, significantly higher than 0.46% of domestic funds. The standard deviation of global funds is 1.95%, compared with 1.07% of domestic funds. In the first half of the sample period (i.e., 1993–1998), the average return of global funds is significantly higher than the return of domestic funds, but it is comparable in the second half of the sample period (i.e., 1999–2004).

Table 1
Return, standard deviation and Sharpe ratio of global and domestic funds

Period	Global funds				Domestic funds				Difference	
	N	Return	Std. Dev.	Sharpe ratio	*N*	Return	Std. Dev.	Sharpe ratio	Return	Sharpe ratio
Entire	188	0.5910	1.9520	0.1088	531	0.4609	1.0745	0.1060	0.1300[a]	0.0028
1993–1998	186	0.7200	1.9243	0.1580	513	0.5095	1.0486	0.0927	0.2105[a]	0.0653[a]
1999–2004	171	0.3562	1.9680	0.0075	476	0.3701	1.0536	0.0809	−0.0139	−0.0734[a]
1993	115	1.2672	1.3416	0.5661	410	0.6175	0.8574	0.3184	0.6497[a]	0.2476[a]
1994	151	−0.4241	1.9419	−0.4577	452	−0.2815	1.0790	− 0.6339	−0.1426[a]	0.1762[a]
1995	174	1.4486	1.9109	0.5636	474	1.2067	0.9121	0.6766	0.2420[a]	−0.1129[a]
1996	180	0.9204	1.4328	0.2240	479	0.2090	1.1294	− 0.1946	0.7114[a]	0.4186[a]
1997	183	0.3023	1.7042	−0.0779	491	0.6437	0.9431	0.1832	−0.3414[a]	−0.2611[a]
1998	182	0.8278	1.9546	0.2196	480	0.6073	0.8297	0.1780	0.2205[a]	0.0416[a]
1999	171	−0.0207	1.6821	−0.3235	462	−0.1013	0.7455	− 0.4612	0.0807	0.1377[a]
2000	161	0.2479	2.1871	−0.1278	447	0.8242	0.7748	0.2774	−0.5763[a]	−0.4052[a]
2001	146	0.1852	1.8752	−0.0527	424	0.5684	1.1387	0.3270	−0.3831[a]	−0.3797[a]
2002	119	0.9907	2.0568	0.4554	394	0.7407	1.1436	0.5763	0.2500[a]	−0.1209[a]
2003	112	1.2450	2.1263	0.5234	369	0.1660	1.3771	0.0717	1.0789[a]	0.4517[a]
2004	103	0.7281	1.7674	0.3068	359	0.2266	0.9926	0.0701	0.5015[a]	0.2367[a]

This table presents average monthly return (%), standard deviation (%), and Sharpe ratio of 188 US-based global funds and 531 domestic funds from January 1993 through December 2004. Sharpe ratio is the ratio of average monthly return in excess of 90-day US *T*-bills divided by standard deviation of monthly returns. All numbers are averaged across global and domestic funds. The difference is the difference in mean returns and Sharpe ratios between global and domestic funds.

[a] Represents significant level at 1% of *t*-statistics for the zero mean difference.

On a risk-adjusted basis, Sharpe ratio for global funds is slightly higher than the ratio for domestic funds for the entire sample period.[3] On average, global funds earn 10.88 basis points per 1 unit of risk, whereas domestic funds earn 10.6 basis points. Global funds significantly outperform domestic funds in the first subperiod, but underperform in the second subperiod. On a year-by-year basis, global funds outperform domestic funds in 7 out of 12 years, whereas domestic funds outperform in 5 years (as shown in the last column of Table 1).

The results thus far suggest that although global funds significantly underperform benchmark indexes, they provide comparable risk-adjusted returns to domestic funds. These results indicate that, for an individual portfolio, international diversification through global funds provides comparable risk-adjusted returns to investing only in domestic funds. This finding is in contrast to the argument of Detzler (1999), who compares performance of global and international bond funds to the performance of broad-based benchmark indexes.

Because returns of global funds are in US dollars, we examine whether exchange rate shift can explain the return difference between global and domestic funds.[4] In addition, we examine three other possible basic risk factors that might explain the differential return: differences in credit quality and duration between global and domestic funds, and the difference in risk characteristics such as liquidity and country-specific risk of government bond markets. The market characteristic difference is measured by the difference in returns between SBWG Index expressed in foreign currency and Lehman Brothers US Government Bond Index. We use SBWG in foreign currency to eliminate exchange rate effect. We regress the difference in monthly returns between global and domestic funds against these four factors.

The regression results in Table 2 indicate that the differential return is significantly negatively related to exchange rate return. About 24% of the differential return can be explained by exchange rate return. The return difference is also positively related to the

[3] The underlying assumption of the simple Sharpe ratio is that the return standard deviation is constant throughout the sample period. This assumption is widely used especially in analysis geared toward an average investor. However, time-varying volatility in asset returns is well-established in the literature (Bollerslev et al., 1992). To allow for time varying, we calculate a conditional Sharpe ratio from the conditional mean and volatility of global and domestic funds using Eqs. (1) and (2) as follows. We assume that the return series follow GARCH(1,1) process. Eqs. (1) and (2) are expressed as

$$r_{i,t} = \alpha + \beta_1 r_{i,t-1} + \beta_2 \mathrm{SPREAD}_{i,t-1} + \beta_3 \mathrm{EQRET}_{i,t-1} + \beta_4 \mathrm{BONDRET}_{i,t-1} + \varepsilon_{i,t}, \quad (1)$$

$$h_{i,t} = \omega + \gamma \varepsilon^2_{i,t-1} + \lambda h_{i,t-1}, \quad (2)$$

where $r_{i,t}$ = return of global and domestic funds at month t, $\mathrm{SPREAD}_{i,t-1}$ = lag of term spread, measured by return difference between long- and short-term SBWG Index for global funds, and return difference between long- and short-term Lehman Brothers (LB) US Government Bond Index for domestic funds at month $t-1$, $\mathrm{EQRET}_{i,t-1}$ = lag of stock market return, measured by MSCI Equity Index return for global funds, and S&P500 Index return for domestic funds at month $t-1$, and $\mathrm{BONDRET}_{i,t-1}$ = lag of cross-market bond return, measured by LB US Aggregate Bond Index return for global funds and SBWG Index return for domestic funds at month $t-1$. The independent variables in Eq. (1) are used to estimate conditional mean and volatility of global and domestic funds because prior studies – especially Ilmanen (1995), Hunter and Simon (2004) – find that these variables are useful information in predicting domestic and international bond returns. The lags of these variables can be viewed as information available to fund managers prior to time t. The results of conditional Sharpe ratio, available upon request, are consistent with those of unconditional Sharpe ratio presented above.

[4] We thank the referee for suggesting the test.

Table 2
Factors explaining difference in returns between global and domestic funds

Regression variables	1	2	3	4	5	6	7
Constant	0.2860[a]	0.2025[a]	0.1740	0.1355	0.9573	−0.4323	−0.5574
	(3.42)	(2.85)	(1.65)	(1.66)	(1.61)	(−1.50)	(−0.54)
r_{FX}	−0.4840[a]	−0.6098[a]	−0.5526[a]	−0.6678[a]	−0.5074[a]	−0.4951[a]	−0.6521[a]
	(−6.79)	(−9.84)	(−6.32)	(−9.62)	(−5.43)	(−5.54)	(−8.62)
DIFF_CHAR		0.3947[a]		0.4755[a]			0.4599[a]
		(7.76)		(7.94)			(7.41)
DIFF_CREDIT					−1.0239		0.4617
					(−1.34)		(0.48)
DIFF_DUR						0.7105[b]	0.3994
						(2.26)	(0.98)
Adj. *R*-squared	0.2400	0.4637	0.2908	0.5727	0.2967	0.3203	0.5688
N	144	144	96	96	96	96	96
F-Statistics	46.15	62.82	39.95	64.26	21.04	23.39	32.32
(*p*-value)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)

This table presents results of the following regression:

$$r_{g,t} - r_{d,t} = \alpha + \beta_1 r_{FX,t} + \beta_2 \text{DIFF\_CHAR}_t + \beta_3 \text{DIFF\_CREDIT}_t + \beta_4 \text{DIFF\_DUR}_t + \varepsilon_t,$$

where $r_{g,t} - r_{d,t}$ = difference in returns between equally weighted portfolios of global and domestic funds at month t; $r_{FX,t}$ = return of trade weighted average index of the broad foreign currencies per US dollar at month t; DIFF_CHAR = difference in returns between Smith Barney World Government Bond (SBWG) Index in foreign currency and Lehman Brothers US Government Bond Index at month t; DIFF_CREDIT = difference in credit quality between the portfolios of global and domestic funds at month t; and DIFF_DUR = difference in duration between the portfolios of global and domestic funds at month t. The trade weighted average currency index is obtained from Federal Reserve Web site. Credit quality and duration are obtained from Morningstar. Credit quality equals 1 for AAA rating, 2 for AA and so on. Regressions 1 and 2 are performed for the entire sample period. Regressions 3 through 7 are performed for 1997 to 2004 due to unavailability of duration. The numbers in parentheses are *t*-statistics.

[a,b] Represent significant level at 1% and 5%, respectively.

difference in market characteristics. The positive coefficient suggests higher liquidity premium and other risk premiums of global bond markets. The exchange rate return and the differential market characteristics combined explain about 50–60% of the return difference. However, the return difference is insignificantly related to the differences in credit quality and duration. This might be due to comparable credit quality and duration between the funds.

3.3. Do global funds provide incremental gains to existing portfolios?

In this section, we evaluate whether US investors receive incremental benefits by adding global funds into existing bond or stock portfolios by using the methodology developed by Elton et al. (1987). Elton et al. show that a gain occurs when a new asset is added to an existing portfolio if Sharpe ratio of the new asset exceeds the product of Sharpe ratio of the portfolio and return correlation between the new asset and the portfolio. To evaluate the incremental diversification benefits of global funds, we test whether the difference between Sharpe ratio of the funds (SHR_g) and the product of Sharpe ratio of an existing

portfolio and return correlation between the funds and the portfolio ($SHR_p \times \rho_{gp}$) is greater than zero.[5]

Ackermann et al. (1999), Edwards and Park (1996) have applied the methodology of Elton et al. (1987) to examine the benefits of hedge funds and international equity diversification. Unlike these studies, which use broad-based indexes as proxies for existing portfolios, we use index funds to represent existing portfolios of US investors. We choose index funds because the indexes are not investible and their returns are not accounted for trading expenses. Further, it is commonly known that, on average, passive portfolios perform as well as or outperform active portfolios, which implies that US investors are better off by simply holding index funds. We choose seven categories of index funds to cover the major asset classes. The index funds that represent the existing portfolios consist of seven intermediate-term US government bond, 30 US aggregate bond, four balanced, 51 small-cap equity, 39 mid-cap equity, 199 large-cap equity and 98 S&P500 index funds.

Table 3, panel A, presents the difference between SHR_g and $SHR_p \times \rho_{gp}$ in the last column. The difference for domestic funds is significantly positive, which suggests that, for US investors who focus on domestic funds, adding global funds into the existing portfolio provides potential diversification gain. The differences for all other existing portfolios except aggregate bond index funds are positive and significant. The significant differences for equity index funds are due to low correlations between global funds and equity index funds. The difference for aggregate bond index funds is significantly negative because the index funds earn a high Shape ratio during the sample period. These findings suggest that global funds provide incremental diversification benefits to not only domestic funds but also equity index funds.[6]

Because expense ratio is negatively related to performance and expense ratios of index funds are much lower than the ratios of global funds, we further analyze incremental diversification benefits of global funds whose expense ratios are similar to those of index funds. We select global funds whose expense ratios are in the lowest quartile. The results are presented in panel B of Table 3. In panel B, we also select domestic funds whose expense ratios are in the lowest quartile.[7] In the last column, the mean differences between

[5] The return correlation is calculated at portfolio level. Because the return correlation at portfolio level is greater than the correlation at individual fund level, the bias is against finding an incremental diversification benefit of global funds and strengthens our conclusion if global funds are found to be beneficial.

[6] To allow for time-varying volatility, we also calculate the difference between SHR_g and $SHR_p \times \rho_{gp}$ using conditional Sharpe ratios and conditional correlation. To estimate the conditional correlation between global and domestic funds, we use a bivariate system of equations. As in Bollerslev (1990), we assume a GARCH(1,1) structure of conditional variances and a nonzero constant conditional correlation between global and domestic fund returns. The equations are expressed as follow:

$$r_{i,t} = \alpha + \beta_1 r_{i,t-1} + \beta_2 \mathrm{SPREAD}_{i,t-1} + \beta_3 \mathrm{EQRET}_{i,t-1} + \beta_4 r_{j,t-1} + \varepsilon_{i,t}, \tag{3}$$

$$h_{i,t} = \omega + \gamma \varepsilon^2_{i,t-1} + \lambda h_{i,t-1}, \tag{4}$$

$$h_{ij,t} = \rho_{ij} \sqrt{h_{i,t}} \sqrt{h_{j,t}}, \tag{5}$$

where $r_{i,t}$ = portfolio return of global and domestic funds at month t, ρ_{ij} = the constant return correlation between global and domestic fund portfolios, and all other variables are defined the same as the variables in Eqs. (1) and (2). The results of using conditional Sharpe ratios and conditional correlation, available upon request, are similar to the results presented above.

[7] It is interesting to note that as expense ratio of global funds increases, the correlations with equity index funds increase, but the correlations with bond index funds decline.

Table 3
Sharpe ratios and correlation between global funds and existing portfolios

Existing portfolios	SHR_p	ρ_{gp}	$SHR_p \times \rho_{gp}$	Difference
Panel A: All global and domestic funds				
Domestic funds	0.1060	0.6203	0.0658	0.0430[a]
Int.-Term US government funds	0.1490	0.6042	0.0900	0.0187[b]
Aggregate bond funds	0.2216	0.6535	0.1448	−0.0360[a]
Balanced funds	0.1157	0.4187	0.0484	0.0603[a]
Small-cap funds	0.1138	0.3039	0.0346	0.0742[a]
Mid-cap funds	0.1091	0.3136	0.0342	0.0745[a]
Large-cap funds	0.0508	0.3015	0.0153	0.0934[a]
S&P500 Index funds	0.0236	0.3009	0.0071	0.1017[a]
Panel B: Global and domestic funds with lowest quartile expense ratio				
Domestic Funds	0.1493	0.6712	0.1002	0.0432[b]
Int.-Term US government funds	0.1490	0.6583	0.0981	0.0454[a]
Aggregate bond funds	0.2216	0.6824	0.1512	−0.0077
Balanced funds	0.1157	0.2537	0.0293	0.1141[a]
Small-cap funds	0.1138	0.1482	0.0169	0.1266[a]
Mid-cap funds	0.1091	0.1543	0.0168	0.1266[a]
Large-cap funds	0.0508	0.1358	0.0069	0.1365[a]
S&P500 Index funds	0.0236	0.1371	0.0032	0.1402[a]

This table presents average Sharpe ratio (SHR) of existing portfolios and return correlation between 188 global funds and existing portfolios from January 1993 through December 2004. The correlation (ρ_{gp}) is the correlation of monthly returns between the portfolio of global funds and an existing portfolio. The number in the fourth column is the product of Sharpe ratio of the existing portfolio and the return correlation. In the last column, the difference is the mean difference (DIFF) between Sharpe ratio of global funds and the number in the fourth column. The *t*-statistics are calculated from $t = \left(\sum_{i=1}^{188} \mathrm{DIFF}_i/188\right)/\left(S(\mathrm{DIFF})/\sqrt{188}\right)$. In panel A, the numbers are calculated for all global and domestic funds. The average Sharpe ratio of global funds is 0.1088. The average expense ratios of global and domestic funds are 1.38% and 0.99%. The average expense ratios of other existing portfolios are 0.33% for intermediate-term US government bond funds, 0.38% for aggregate funds, 0.26% for balanced funds, 0.8% for small-cap funds, 0.83% for mid-cap funds, 0.70% for large-cap funds, and 0.64% for S&P500 funds. In panel B, the numbers are calculated for global and domestic funds whose expense ratios are in the lowest quartile. The average Sharpe ratio of global funds with lowest quartile expense ratio is 0.1435. The average expense ratios of the lowest quartile global and domestic funds are 0.68% and 0.45%.
[a,b] Represent significant level at 1% and 5%, respectively, of *t*-statistics for the zero difference.

SHR_g and $SHR_p \times \rho_{gp}$ for all existing portfolios except aggregate bond index funds are significantly positive and higher than the differences in panel A of Table 3.[8] The higher differences are results of higher Sharpe ratio of low-expense global funds and low correlations with equity index funds. The difference for the aggregate bond index funds is negative but insignificant. Overall, the results in Table 4 indicate that global funds are beneficial to existing portfolios of domestic funds as well as equity funds. The benefit is greater for global funds with a low-expense ratio.

To provide an intuition for the Elton et al. (1987) measurement of incremental gain, we rearrange the difference between SHR_g and $SHR_p \times \rho_{gp}$ to the reward-to-risk ratio of $(R_g/R_p)/\beta_{g/p}$ where R_g and R_p are excess returns of global funds and the existing portfolio, respectively, and $\beta_{g/p}$ is the ratio of return covariance between global funds and the exist-

[8] The mean differences for high-expense global funds are still positive, but the level of significance drops to 5%.

Table 4
Performance of portfolios of global and domestic funds

Period	Domestic	Global	EW	80/20
Panel A: Performance over different sample periods				
Entire	0.1060	0.1088	0.2012	0.1652
		(0.7887)	(<0.0001)	(<0.0001)
1993–1998	0.0927	0.1580	0.1882	0.1488
		(<0.0001)	(<0.0001)	(<0.0001)
1999–2004	0.0809	0.0075	0.2141	0.1817
		(0.0005)	(<0.0001)	(<0.0001)
Panel B: Performance during volatile periods				
Sep–Nov'94	−0.9576	−0.0834	−0.5213	−0.8059
		(<0.0001)	(<0.0001)	(<0.0001)
Jul–Sep'97	0.4535	0.2300	0.4267	0.4829
		(<0.0001)	(0.0050)	(0.0020)
Jul–Sep'98	0.9038	0.5490	0.8480	0.9407
		(<0.0001)	(0.0016)	(0.0370)
All months	0.1344	0.2584	0.2512	0.2059
		(<0.0001)	(<0.0001)	(<0.0001)

This table presents performance of domestic and global funds, an equally weighted portfolio of global and domestic funds (EW) and a portfolio of 80% domestic funds and 20% global funds (80/20). Performance is measured by Sharpe ratio. In panel A, the Sharpe ratio is calculated over the entire sample period from January 1993 through December 2004, and two subperiods. In panel B, Sharpe ratio is computed over three periods of volatile bond markets; the 1994 US bond market meltdown, the 1997 Asian currency crisis, and the 1998 Russian default. For both panels, the numbers in parentheses are *p*-values of *t*-statistics for the zero mean difference between domestic funds and global funds, EW, or 80/20.

ing portfolio to return variance of the existing portfolio.[9] As an example, the reward-to-risk ratio for the existing portfolio of domestic funds is 1.7435, given that the average R_g and R_d are 0.2344 and 0.1193, respectively, and $\beta_{g/p}$ equals to 1.1269. The ratio of 1.7435 implies that it is valuable to add global funds to a portfolio of domestic funds because the reward is 1.7435% per 1 unit of the risk.

To confirm the results in Table 3 that US bond investors can benefit from adding global funds to their existing domestic funds, we further evaluate performance of the combined portfolios between domestic and global funds. We assume that investors follow one of two simple diversification strategies: (a) an equally weighted portfolio of domestic and global funds (EW portfolio), or (b) 80% domestic funds and 20% global funds (80/20 portfolio). Panel A of Table 4 presents the average Sharpe ratio of the portfolios and global funds compared with domestic funds over the sample period. For the EW portfolio, the Sharpe ratio is 0.2012, which is significantly higher than the ratio for domestic funds. Similarly, the Sharpe ratio for the 80/20 portfolio (0.1652) is significantly higher than the ratio for domestic funds. These results are consistent with the earlier findings and suggest that investors who pursue these two simple investment strategies can obtain an incremental diversification benefit by adding global funds into their domestic portfolios. For every 1% of risk as measured by standard deviations, investors who add global funds to their portfolios can enhance returns of their domestic bond portfolios by 5.92–9.52 basis points per month.

[9] We thank Steve Sears and the referee for suggesting the intuition.

To show economic significance of the extra returns of EW and 80/20 portfolios, we create a synthetic portfolio of EW and 80/20 with risk equal to domestic funds. The additional return of the synthetic portfolio equals to $[r_f + SHR_p \times \sigma_d] - r_d$ where r_f is T-bill rate, SHR_p is Sharpe ratio of the synthetic portfolio, and r_d and σ_d are return and standard deviation of domestic funds, respectively.[10] For the entire period, the extra return for EW is about 0.96% per year. For 80/20 portfolio, the extra return is 0.48% per year. For both portfolios, the extra returns of the first subperiod are comparable to the returns of the entire period. The extra returns of the second subperiod are 1.31% and 0.91% per year for EW and 80/20 portfolios, respectively. These findings suggest that by adding global funds to domestic funds, investors can enhance return by 0.5–1% per year without increasing risk.

3.4. Performance of global funds during high volatility period in bond markets

As a supplement, we examine performance of global funds during the periods of high volatility in bond markets. The evidence in equity markets suggests that the benefits of international diversification tend to disappear during high-stress periods (Solnik et al., 1996), while the evidence in bond markets is mixed. Hunter and Simon (2004) contend that US bond investors can still benefit from international bond diversification through a currency-hedged portfolio during periods of volatile bond markets. However, hedging is costly and complicated to implement for an average investor.

In panel B of Table 4, the Sharpe ratio for domestic funds is lowest during US-led meltdown in 1994 due to low return. Although domestic funds have the highest Sharpe ratio during the 1997 Asian crisis and 1998 Russian crisis, they provide the lowest ratio over the entire three periods of the volatile bond markets. Over the three periods, the EW portfolio earns the highest Sharpe ratio (0.2521), which is significantly higher than domestic funds (0.1344). The 80/20 portfolio also has a significantly higher Sharpe ratio than domestic funds. Taken together, these results suggest that internationally diversified portfolios help reduce risk for domestic bond fund investors during periods of volatile markets. Our results lend support to Hunter and Simon (2005), who find that in an extremely high volatility period, correlations between US and major bond markets, in fact, decrease not increase. These results sharply contradict the evidence from equity markets that the benefits of international diversification disappear when most needed.

4. Performance persistence, seasonality, and characteristics

4.1. Performance persistence

We adapt the procedure of Elton et al. (1996) to examine performance persistence of global funds. The procedure involves performance rankings during two periods: (a) the selection period and (b) the evaluation period. During the selection period, funds are ranked and placed in deciles based on (a) average monthly Sharpe ratio (SHR) over the 1-year period, (b) average monthly SHR over the 3-year period, (c) 1-year holding period

[10] This is the M^2 measure. The equation is similar to Eq. (2) of Chang et al. (1995), who analyze incremental returns of closed-end country funds.

Table 5
Realized Sharpe ratio and ranking correlation for different ranking criteria

Deciles		Deciles formed on the basis			
		1-Year HPR	3-Year HPR	1-Year SHR	3-Year SHR
Panel A: Realized Sharpe ratio and ranking correlation					
Top	1	0.2156	0.2186	0.2551	0.1996
	2	0.1551	0.1441	0.1541	0.1879
	3	0.2157	0.1795	0.1345	0.1790
	4	0.0920	0.1106	0.0963	0.1178
	5	0.0758	0.0137	0.0395	0.0258
	6	0.0478	0.0588	0.0357	0.0781
	7	0.0539	0.0935	0.0678	0.0483
	8	−0.0040	0.0279	0.0340	0.0407
	9	0.0325	0.0135	0.0808	0.0293
Bottom	10	0.0442	0.0690	0.0317	0.0211
Rank correlation		0.2280	0.1679	0.2294	0.2178
		(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Panel B: Difference in Sharpe ratios between top and bottom deciles and between top deciles and average funds					
Top vs. bottom		0.1714	0.1496	0.2234	0.1785
		(0.0002)	(0.0001)	(<0.0001)	(<0.0001)
Top vs. average		0.1240	0.1254	0.1629	0.1074
		(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)

Panel A of this table presents the average monthly Sharpe ratio of global funds realized in the year following the selection periods. In the selection period, global funds are ranked and placed in deciles on the basis of 1- and 3-year holding period return (HPR) and 1- and 3-year Sharpe ratio (SHR). The ranking correlation is the correlation of performance ranking between two periods: selection period and evaluation period. The selection period is either 1- or 3-year period. The evaluation period is 1 year subsequent to the selection period. Panel B presents the difference in Sharpe ratios during the evaluation period between the top and bottom deciles, and between the top deciles and average funds for different ranking criteria. The numbers in parentheses in panel A are *p*-values testing for the zero ranking correlation, and the numbers in parentheses in panel B are *p*-values testing for the zero difference.

return (HPR), and (d) 3-year HPR. During the evaluation period, funds are ranked based on average monthly SHR calculated over 1 year following the selection period. The monthly SHR calculated in the evaluation period is a measure of realized performance.[11] To test whether performance persistence exists among the funds, we calculate correlation of rankings between the selection and evaluation periods. The significant correlation suggests that past performance has predictive power. Table 5 presents the results. The column headings show the criteria used to rank funds during the selection period.

On the basis of 1-year SHR, Sharpe ratio generally decreases from the top to the bottom deciles. We also find a similar pattern when using 3-year SHR, but not when using 1- and 3-year HPR as ranking criteria. However, the best performers of 1- and 3-year HPR are still in the top three deciles, and the worst performers are in the bottom three deciles.

[11] For example, for the selection period ending in 1995, we rank the funds and place in deciles based on 1-year SHR and HPR calculated during January to December 1995 and 3-year SHR and HPR calculated during January 1993 to December 1995. The corresponding evaluation period is January to December 1996. We repeat the process for every year. The process is done nine times during the sample period. Note that we omit 1993 and 1994 so that all ranking criteria can be performed for equal number of periods. The standard deviation for SHR is calculated using the entire sample period to reduce the effect of outliers over the period of 12 months.

For all ranking criteria, the correlations are positive and significant at the 1% level. These findings suggest that past performance and future risk-adjusted performance of global funds are significantly correlated. The correlations based on 1-year ranking are higher than those based on 3-year ranking. The higher correlations of 1-year ranking also suggest that the 1-year selection period has higher predictive power than the 3-year selection period. These results are consistent with the findings of Elton et al. (1996). However, the correlations of global funds are much smaller than those of equity funds (between 0.87 and 1).

The next obvious question is: Can information about past performance help earn higher risk-adjusted return than average in the future? We compare the performance of top deciles with that of bottom deciles in panel B of Table 5. The difference in Sharpe ratios between top and bottom deciles ranges from 0.15 to 0.22 per month. The difference for all ranking criteria is significant at the 1% level. Compared with the average, top deciles funds outperform the average funds significantly for all ranking criteria. These results suggest that investors selecting funds in the top deciles earn significantly higher risk-adjusted return than those who choose the funds from bottom deciles and from an average fund.[12]

The results in Table 5 are presented in terms of average Sharpe ratios over the last 9 years of the sample period. To further examine the predictive power of 1-year criteria, we analyze the ranking correlation year by year. The results of 1-year HPR are qualitatively similar to those of 1-year SHR and hence only the results of 1-year SHR are presented in Table 6. In panel A, the ranking correlations are significant for all years. The correlations are positive for years 4, 5, 8, 9, 11 and 12, and negative for years 2, 3, 6, 7 and 10. These findings suggest that 1-year criteria both on SHR and HPR have predictive ability in 6 out of 11 years.

In panel B of Table 6, top deciles outperform bottom deciles significantly in 5 out of 11 years. Top deciles also outperform the average funds in 7 out of 11 years. Using total returns (HPR), we find that the top deciles outperform the bottom deciles in 5 out of 11 years and outperform average funds in 6 out of 11 years (results not tabulated). These results show that the predictive ability of 1-year SHR ranking criteria is similar to the ability of 1-year HPR ranking criteria. Taken together, the results in Tables 5 and 6 suggest that (a) short-run persistence does exist in global funds, (b) the ranking based on 1-year past performance provides higher predictability over next period's performance than the ranking based on 3-year past performance, and (c) on a yearly basis, the ranking based on SHR has similar predictive power to the ranking based on total return (HPR).

We further examine the usefulness of performance persistence in choosing global funds to combine with an existing portfolio of domestic funds. Specifically, we test whether investors who hold portfolios of global and domestic funds can benefit by replacing average global fund with top deciles global funds. We use two portfolios of global and domestic funds created earlier (i.e., EW and 80/20) as benchmarks. We create four additional portfolios by replacing average global fund with top deciles global funds ranked by 1-year HPR and 1-year SHR. These portfolios are called Top-EW and Top-80/20. Then, we measure performance of the four portfolios during the 1-year period following the ranking period and compare with the benchmarks.

[12] We also test whether investors who select actively traded global funds (with high turnover) earn higher risk-adjusted return and find a rather weak support.

Table 6
Realized Sharpe ratio based on 1-year SHR ranking criteria

Period		2	3	4	5	6	7	8	9	10	11	12
Panel A: Realized Sharpe ratio and ranking correlation												
Top	1	−0.6773	0.3205	0.5946	0.2342	0.3054	−0.4725	0.0643	0.1330	0.5112	0.6934	0.5486
	2	−0.7040	0.4941	0.2831	0.1426	0.2275	−0.4756	−0.0122	0.2124	0.3416	0.5671	0.3801
	3	−0.6256	0.5682	0.1249	0.0873	0.1268	−0.3664	0.0323	0.2396	0.3324	0.6411	0.2964
	4	−0.5989	0.4831	0.1868	−0.0312	0.0684	−0.3085	−0.0532	0.0041	0.3373	0.6134	0.3595
	5	−0.4824	0.4183	0.0883	−0.0908	0.1515	−0.3585	−0.0655	−0.2745	0.4023	0.5257	0.3177
	6	−0.3908	0.5767	0.1268	−0.1488	0.1801	−0.2778	−0.1261	−0.1658	0.4064	0.3119	0.2895
	7	−0.4801	0.6266	0.2059	−0.1719	0.3154	−0.3215	−0.2432	−0.0702	0.6462	0.2431	0.2667
	8	−0.3506	0.3958	0.1268	−0.2310	0.2349	−0.3808	−0.2264	−0.1636	0.5151	0.5270	0.2582
	9	−0.6667	0.5556	0.3373	−0.2257	0.3148	−0.1347	−0.2817	−0.2019	0.4969	0.5020	0.1827
Bottom	10	−0.0886	0.6111	0.1397	−0.3297	0.2508	−0.1432	−0.3702	−0.2374	0.5750	0.6263	0.1739
Ranking correlation		−0.4486 (<0.0001)	−0.1747 (0.0319)	0.2048 (0.0067)	0.7192 (<0.0001)	−0.1716 (0.0216)	−0.3421 (<0.0001)	0.4675 (<0.0001)	0.6562 (<0.0001)	−0.3346 (0.0002)	0.3191 (0.0006)	0.6192 (<0.0001)
Panel B: Difference in Sharpe ratios between top and bottom deciles and between top deciles and average funds												
Top vs. bottom		−0.5887 (<0.0001)	−0.2906 (0.0113)	0.4549 (<0.0001)	0.5639 (<0.0001)	0.0546 (0.2683)	−0.3293 (0.0033)	0.4344 (0.0001)	0.3703 (<0.0001)	−0.0638 (0.4861)	0.0671 (0.4995)	0.3747 (<0.0001)
Top vs. average		−0.1673 (0.0272)	−0.1839 (0.0046)	0.3741 (<0.0001)	0.3107 (<0.0001)	0.0880 (0.0043)	−0.1475 (0.0316)	0.1921 (0.0003)	0.1857 (0.0003)	0.0558 (0.3672)	0.1700 (0.0126)	0.2418 (<0.0001)

Panel A of this table presents the average monthly Sharpe ratio of global funds realized in a year following periods when global funds are ranked and placed in deciles using 1-year Sharpe ratio. The ranking correlation is the correlation of performance ranking between two periods: the selection period and the evaluation period. The selection period is 1 year, starting in Year 1 through Year 11. The evaluation period is 1 year subsequent to the selection period (i.e., Year 2-Year 12). Panel B presents the difference in Sharpe ratios during the evaluation period between the top and bottom deciles and between the top deciles and average funds for different ranking criteria. The numbers in parentheses in Panel A are *p*-values testing for the zero ranking correlation, and the numbers in parentheses in panel B are *p*-values testing for the zero difference.

Based on the 1-year SHR, the portfolios of Top-EW and Top-80/20 outperform the average of domestic and global funds in 7 out of 11 periods (results not tabulated). Similarly, the portfolios of Top-EW and Top-80/20 outperform the average portfolios in 6 out of 11 periods. However, none of the outperformance is significant. The result in this part is a bit puzzling to us. First, we show that mixing an average global fund with an average domestic fund provides significant gain. Second, we find that last year's best performer of global funds outperform average global funds in the subsequent year, an indication of performance persistence. However, the results suggest that no significant gain is found in mixing last year's winner of global funds with an average domestic fund over a portfolio of average global and domestic funds. These results lead us to conclude that the average portfolio is a well-diversified one, and thus no diversification gain is realized from performance persistence found in global funds.

4.2. Seasonality

To examine the presence of return seasonality among global funds, we first analyze average return in the calendar month of the funds along with SBWG Index. Our initial results do not indicate any January effect in global funds and the index (results not tabulated). The two highest returns for the funds as well as the SBWG Index are in September and December. To further examine the return seasonality of global funds, we run regressions between average monthly returns of the funds, both total and risk-adjusted returns, and a set of dummy variables representing calendar months except October. We select October as the comparison month because the average return in October is closest to the average return (about 0.6%) of all months for global funds. Because the study period covers three declining periods of US and world bond markets, we also include dummy variables in the regressions to isolate the effects of these volatile periods. If global funds exhibit seasonality pattern, we should observe significant coefficients on one or more calendar month variables.

The coefficients for January, September, and December are positive in both regressions; however, they are insignificantly different from zero (results not tabulated). In addition, none of the coefficients of other calendar months are significant. These results suggest that global funds do not exhibit seasonality. Although this finding does not support the findings of some prior studies such as Chang and Huang (1990), Fridson (2000), it is consistent with the finding of Maxwell (1998), who reports no seasonality on investment grade corporate bonds.

As expected, the coefficients for the SBWG Index are significantly positive for both regressions. The coefficients for 1994 US meltdown and 1998 Russian default are negative, whereas the coefficient for 1997 Asian crisis is positive; however, all the coefficients are not significantly different from zero. These findings suggest that the periods of volatile bond markets do not significantly affect returns of global funds over the sample period.[13]

[13] When the sample is partitioned into two subperiods, the coefficients of 1994 US decline and 1998 Russian default are significantly negative for the first subperiod (i.e., 1993–1998). These findings suggest that both events affect the returns of global funds only in the short period. The insignificant coefficient of 1997 Asian crisis can be explained by small size of bonds issued by Asian countries (see Basta, 2000, for statistics).

Table 7
Regression results between fund performance and characteristics

Variables	Regression 1 return	Regression 2 Sharpe ratio	Regression 3 return	Regression 4 Sharpe ratio
Constant	−0.0589	−0.0660	−0.0065	0.0291
	(0.6305)	(0.2722)	(0.9514)	(0.6232)
Maturity	0.0539[a]	0.0117[a]	0.0648[a]	0.0171[a]
	(<0.0001)	(0.0010)	(<0.0001)	(<0.0000)
Size	0.0719[a]	0.0288[a]	0.0585[a]	0.0246[b]
	(<0.0001)	(0.0012)	(0.0013)	(0.0134)
Age	−0.0249[a]	−0.0040	−0.0331[a]	−0.0185[a]
	(0.0005)	(0.3242)	(0.0002)	(0.0002)
Expense ratio	0.0633	−0.0335	−0.0010	−0.0647[a]
	(0.2108)	(0.1753)	(0.9813)	(0.0081)
Load	−0.0121	−0.0045	−0.0006	0.0049
	(0.3121)	(0.4635)	(0.9520)	(0.4087)
Tenure	0.0138[c]	0.0100[b]	0.0146	0.0081
	(0.0638)	(0.0207)	(0.2171)	(0.2153)
Turnover	−0.0159	0.0014	−0.0020	0.0062
	(0.1653)	(0.8174)	(0.8566)	(0.3083)
N	1058	1058	182	182
Adjusted R^2	0.0716	0.0255	0.3896	0.1922
p-Value of F-test	<0.0001	<0.0001	<0.0001	<0.0001

This table presents the regression results between performance of global funds and fund characteristics. In Regressions 1 and 3, performance is measured by the average monthly return. In Regressions 2 and 4, performance is measured by the average monthly Sharpe ratio. Sharpe ratio is the ratio of monthly return in excess of 90-day US T-bills divided by standard deviation of monthly returns. Maturity is average maturity of bonds in a fund. Size is the natural log of net assets ($million) of a fund. Age is number of years that a fund has been in operation. Expense ratio is operating expenses and management fees including 12b-1 fees expressed as a percentage of net assets. Load is the total of initial and deferred sales charges. Tenure is number of years that the current management team had been with the fund. Turnover is the ratio of the lesser of purchases or sales to average monthly net assets. Fund characteristics are obtained from CRSP and Morningstar. The regressions are performed across fund-years for the first two regressions and across funds for the last two regressions. For Regressions 3 and 4, the independent variables for each fund are mean values across the sample period. The number of observations in Regressions 3 and 4 drops to 182 due to unavailability of expense ratio and turnover. N Represents number of observations with all available independent variables. The numbers in parentheses are White-adjusted p-values for Regressions 1 and 2 and p-values of t-statistics for Regressions 3 and 4.
[a,b,c]Represent significant level at 1%, 5%, and 10%, respectively.

4.3. Performance and characteristics

To test whether characteristics of global funds can explain the performance, we regress the funds' returns on their characteristics: maturity, size, age, expense ratio, load, management tenure, and asset turnover.[14] We perform the regression across fund-years and across funds. For fund-year regressions, performance is the average return over a year, and independent variables are at year-end. For across fund regressions, performance is the average

[14] We thank the referee for suggesting the maturity variable. We also include credit rating as an independent variable to capture another dimension of funds' risk characteristics. The coefficient of the credit rating is not significantly related to the risk-adjusted return. This might be due to the fact that almost all funds' compositions are high-rated bonds.

return over the sample period, and independent variables are mean variables. The regression is run across funds to reduce influence of funds that survive for longer periods.

Table 7 presents the results of the regressions between performance and fund characteristics. As expected, the coefficient of maturity is significantly positive. In all regressions, controlled for maturity, performance is positively related to size. This result suggests that with equal maturity, larger funds outperform smaller ones. The significantly negative coefficients for age indicate that newer funds perform better than older funds. In Regression 4, the expense ratio is significantly negatively related to Sharpe ratio. This finding indicates that funds that charge higher expense ratios are associated with lower risk-adjusted returns. The slope coefficient of tenure is positive for Regressions 1 and 2, suggesting that funds with long tenure outperform those with short tenure. However, the significant coefficient of tenure might be influenced by global funds that survive for long periods because the coefficient is insignificant in Regressions 3 and 4.

The coefficients for load and turnover are not significant. The insignificant coefficient for turnover implies that controlled for other factors, actively managed funds do not provide superior performance. This provides an interesting result that lends support to passively managed strategy. The adjusted R^2 for all models are comparable to the R^2 reported in prior studies such as Ackermann et al. (1999), Chevalier and Ellison (1999). Taken together, our findings suggest that performance of global funds is related to the funds' characteristics: maturity, size, age, and expense ratio. Investors are better off with large and new funds with long maturity that charge a low-expense ratio regardless of how actively managers trade their assets.[15]

5. Summary and conclusion

This article examines diversification benefits and performance persistence of 188 US-based global bond funds (global funds) during the period of January 1993 through December 2004, using both unconditional and conditional Sharpe ratios. Global funds underperform benchmark indexes. However, the underperformance is less than the funds' expense ratio. Global funds provide higher total returns than and comparable risk-adjusted returns to US-based bond funds that invest only in the US bond markets (domestic funds). About 50–60% of the differential return between global and domestic funds can be explained by exchange rate return and difference in risk characteristics of government bond markets.

For US investors whose portfolios are concentrated in domestic funds, adding global funds to the portfolios can enhance the return by 0.5–1% per year without increasing risk. Global funds also provide incremental benefits to equity fund investors. Contrary to the conventional wisdom, benefits of international diversification from global funds do not disappear during periods of volatile bond markets (e.g., 1994, 1997, and 1998).

Global funds show some performance persistence. The 1-year ranking criteria can be used to predict subsequent year's winners and losers. However, the ranking correlation of global funds is much lower than that of equity funds found in prior studies. Global funds do not exhibit seasonality pattern. Although the returns in September and December are higher than the returns in other months, they do not persist. Finally, we find that

[15] Our results in this part are generally consistent with Ferson et al. (2003): Young US government bond funds with low expense and low turnover perform better in certain economic conditions.

investors should select larger funds with long maturity and avoid older funds with a high-expense ratio. In sum, global funds provide diversification benefits to US bond investors during the sample period.

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