Safe withdrawal rates from retirement savings for residents of emerging market countries

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by

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Abstract

Researchers have mostly focused on U.S. historical data to develop the 4 percent withdrawal rate rule. This rule suggests that retirees can safely sustain retirement withdrawals without outliving their wealth for at least 30 years, if they initially withdraw 4 percent of their savings and adjust this amount for inflation in subsequent years. But, the time period covered in these studies represents a particularly favorable one for U.S. asset returns that is unlikely to be broadly experienced. This poses a concern about whether safe withdrawal rate guidance from the U.S. can be applied to the situation in other countries. Particularly for emerging economies, defined-contribution pension plans have been introduced along with under-developed or non-existing annuity markets, making retirement withdrawal strategies an important concern. We study sustainable withdrawal rates for a sample of 25 emerging countries and find that the sustainability of a 4 percent withdrawal rate differs widely and can likely not be treated as safe. The results suggest, as well, high stock allocations in the portfolio mix are not the optimal choice for retirees in emerging market countries.

Introduction

What is the safe withdrawal rate from un-annuitized retirement savings that will provide the most retirement income for retirees without exhausting their savings? Potential retirees must answer this question to know if their expected spending needs can be reasonably supported from their savings. When the withdrawal rate is too high, retirees are vulnerable to the risk of income shortfalls and poverty at later ages. A low withdrawal rate, on the other hand, may lead retirees to sacrifice the opportunity of a higher sustainable living standard.

Recent interest in addressing this issue has resulted in a growing literature. Using various simulation techniques including historical overlapping, bootstrapping, and Monte Carlo simulations, researchers have developed a variety of rules and strategies in the hope of giving retirees appropriate guidelines for their retirement planning. A range of withdrawal rates have been recommended along with asset allocation strategies to safely sustain retirees for a required number of years. Among numerous studies, the 4 percent withdrawal rule has been widely accepted as a safe sustainable withdrawal rate, and it has become an established baseline for testing other approaches.

In the pioneering study for this field, Bengen (1994) suggests that an initial withdrawal rate of 4 percent adjusted for inflation in subsequent years should be safe and sustainable for at least 30 years. He further recommends a starting allocation to stocks between 50 and 75 percent. In subsequent research, Bengen (1996) indicates that a 4 percent withdrawal rate is sustainable even when the proportion of stocks in the portfolio is gradually reduced over time. Bengen (1997) includes small capitalization stocks into the portfolio mix and finds a notable increase in the sustainable withdrawal rate. In his latest research, Bengen (2006) indicates that even 5 percent can be safely sustainable under certain conditions.

Other studies also give support for the sustainability of 4 percent or higher withdrawal rates. Cooley, Hubbard, and Walz (1998), using historical simulations, report that allocating 50 percent to stocks and 50 percent to bonds provides a 95 percent historical success rate for a 4 percent real withdrawal rate over 30 years. The success rate increases to 98 percent when increasing the share of stocks to 75 percent. Monte Carlo simulations by Ameriks, Veres, and Warshawsky (2001) indicate that a 4.5 percent real

withdrawal rate is possible with an 8.3 percent chance of exhausting money in 30 years. Tezel (2004), using historical simulations, finds that 4.5, 5.5, and 6.5 percent real withdrawal rates work for time horizons of 30, 20, and 10 years, respectively, with the chance of exhausting money during retirement below 8 percent. Spitzer, Strieter, and Singh (2007) also find that a 4.4 percent real withdrawal rate with 50 percent stocks can be used with a 10 percent chance for failure within 30 years. These studies also find importance for allocating a high proportion to stocks in the portfolio mix. Terry (2003), on the other hand, suggests a negative relationship exists between stock allocations and withdrawal rates. Studies by Pye (2000), Guyton (2004), Guyton and Klinger (2006), and Robinson (2007) also explore various decision rules and withdrawal strategies to achieve higher initial withdrawal rates without harming the overall chances for success.

While much of the existing literature supports the safety of the 4 percent withdrawal rate, the conclusions are usually based on the data for U.S. asset returns since 1926. This covers a particularly fortuitous time period for the U.S. that is unlikely to be attained over a regular basis by any country. Blanchett and Blanchett (2008) acknowledge that past market conditions may not suitably represent what will happen in the future. They note that, based on the average expected forecast for future stock returns from a variety of sources, the future real returns for a 60/40 portfolio of stocks and bonds in the U.S. can be expected to be between 1 and 2 percentage points less than historical averages. Dimson, Marsh, and Staunton (2004) also argue that looking at the past U.S. data for future predictions will lead to "success bias". This expectation of lower future stock returns in the U.S. is also noted by Bogle (2009) and Krugman (2005) as well. Overall, conclusions reached by previous studies may provide overly optimistic recommendations about future sustainable withdrawal rates, which could therefore jeopardize retirement spending at later ages.

Very few studies about safe withdrawal rates consider countries other than the U.S. Pfau (2010) is one exception that includes 17 developed market economies. The study shows that the U.S. enjoyed consistently low inflation, and high returns and low volatility on stocks and bonds, relative to other countries. With historical simulations, his results show that only 4 countries including Canada, Sweden, Denmark, and the U.S. could attain a maximum worst-case withdrawal rate exceeding 4 percent for a 30-year

retirement duration. This calculation does not include account fees and assumes that retirees in each year had the perfect foresight to choose the best performing asset allocation. He also finds that the best worst-case maximum withdrawal rates occur with stock allocations of at least 48 percent for all countries except Switzerland. These findings, in addition to the potentially weaker performance of future market returns, pose a concern about the wide applicability of the 4 percent rule.

Estimating sustainable withdrawal rates is of particular importance for lesser developed economies with limited annuity markets and growing reliance on defined-contribution pension plans. To the best of our knowledge, we are providing the the first attempt to address this issue for emerging market economies. We investigate both the applicability of the widely accepted 4 percent withdrawal rule, as well as the issue of asset allocation during retirement.

Data and Methodology

This study uses data from a variety of sources available through the end of 2009. Returns on domestic stocks for the 25 countries are obtained from the MSCI Stock Indices. They are calculated as the annual percentage change at year end for the MSCI Standard Core Gross Indices. We also use domestic currency deposit rates, taken from the International Monetary Fund's International Financial Statistics (IFS), to represent the local fixed income returns. Two exceptions are that we use the central bank discount rate for India and Jordan in 1988-89 and the call money rate for Pakistan. Also, for Poland, we made adjustments to match recent and earlier deposit rates after a change in the methodology of reporting deposit rates in 2002. Inflation rates are also taken from the IFS. We use the longest available time period of data for each country, except that we drop the periods of extreme hyperinflation in Argentina and Brazil. Analysis is based on the real returns for stocks and deposit rates. Even though we would also like to consider short-term and long-term government debt, such data is not available for many of the emerging countries.

Unlike Pfau (2010), which could consider historical simulations with 109 years of data for each developed market country, we use a bootstrapping Monte Carlo approach with the limited historical data for emerging markets. Annual in-sample returns are randomly selected with replacement to form hypothetical multi-year simulation periods

for asset returns. We simulate 10,000 hypothetical asset return paths for retirees in each country. For each simulation, we optimize across the two domestic assets, finding the fixed asset allocation that provides the highest sustainable withdrawal rate for 30 years. This is called the perfect foresight assumption, and it provides an overly optimistic assessment for sustainable withdrawal rates. To correct for this, we also investigate how sustainable withdrawal rates vary by asset allocation. We consider 21 possibilities for fixed asset allocations, ranging in 5 percentage point increments from 0 to 100 percent stocks, with the remainder allocated to bank deposits. We assume a fixed retirement duration of 30 years to be analogous with previous studies. Modifying this assumption is simple, and most studies find that sustainable withdrawal rates decrease, but at a decreasing rate, as the retirement duration increases. Other assumptions include no deductions for administrative fees, annual rebalancing to the targeted asset allocations, and no taxes.

We assume that the annual account withdrawal is set as a percentage of the accumulated portfolio at the retirement date. Since we have adjusted our data to eliminate the impact of inflation, our resulting withdrawal rates are expressed in terms of real purchasing power. Constant withdrawals are made at the start of each year. The remaining account balance, divided among the two assets, then grows or shrinks by that year's asset returns, and at the end of the year the portfolio is rebalanced to the target asset allocation. If the withdrawal pushes the account balance to zero, the withdrawal rate was too high and the portfolio failed to be sustainable for 30 years. We calculate the maximum sustainable withdrawal rate for each simulation.

Results

// Table 1 About Here //

Table 1 provides summary statistics for asset returns and inflation for the available time periods in 25 emerging market economies. Asset returns are provided in real terms after removing the effects of inflation. The returns for stocks and fixed income assets vary across countries. Stocks provide double-digit average returns for all countries except China, Israel, Jordan, Morocco, and Poland. However, stock volatility, as measured by standard deviation, tends also to be very high. Standard deviations for real stock returns were under 30 percent in only 4 of the 25 countries. On the other hand,

fixed income assets tend to provide lower average returns and risks in these countries. Fixed income assets provide real returns under 5 percent in all countries except Brazil. Real average returns are even negative for some countries. At the same time, Russia is the only country which experienced fixed income asset volatility above 10 percent. For inflation, average rates were above 10 percent in Brazil, Columbia, Hungary, Indonesia, Mexico, Russia, Sri Lanka, and Turkey. Table 1 also includes the correlations between stocks and fixed income assets. The correlation coefficients are small and even negative in eight cases, implying potential diversification benefits.

// Table 2 About Here //

Table 2 provides simulation results for sustainable withdrawal rates over 30 years at various distribution percentiles. The distributions are based on whichever asset allocation provides the highest withdrawal rate over 30 years in each simulation. In the worst-case scenario, only retirees in Brazil, Colombia, South Africa, Chile, Morocco, and Korea could sustain a 4 percent withdrawal rate, and retirees in 12 countries could not sustain a 3 percent withdrawal rate. In Egypt, Peru, Jordan, China, Sri Lanka, Turkey, Mexico, and Russia, the highest withdrawal rate for the worst-case scenario is lower than 2 percent.

Focusing on the worst-case scenario from 10,000 simulations may be criticized as overly pessimistic or risk averse, and the table also provides withdrawal rates at the 1st, 5th, and 10th percentiles. These percentiles provide the withdrawal rates which can be sustained for 30 years with a 1 percent, 5 percent, and 10 percent chance of failure, respectively. However, Terry (2003) argues that when dealing with irreplaceable assets and uncertainties, even a 1 percent probability of failure is excessively high. Fullmer (2008) also argues that downside risk is a painful aspect of risk and is more unbearable after retirement when options such as continuing to work have declined. At the 1st percentile (i.e. 99 percent chance of success), sustainable withdrawal rates exceed 4 percent in 8 out of 25 countries: Brazil, Columbia, South Africa, Chile, Morocco, Korea, Israel, and Indonesia. If a 5 percent failure rate is accepted, a 4 percent withdrawal rate is sustainable in 14 countries. With a 5 percent failure rate, a withdrawal rate of 7 percent is possible in Brazil, and it is almost 6 percent in Columbia and Chile, and 5 percent in South Africa. However, in 5 countries even a 3 percent withdrawal rate was not

sustainable. The number of countries with withdrawal rates exceeding 4 percent increases to 16 with a 10 percent failure rate, but this leaves 9 countries with sustainable rates below 4 percent even with a 10 percent chance of failure.

The last two columns of Table 2 show the percentage of failures with fixed withdrawal rates of 4 and 5 percent. With the 4 percent withdrawal rate, 4 countries experience failures in more than 25 percent of cases, while 15 countries experience this outcome with a 5 percent withdrawal rate.

// Table 3 About Here //

Table 3 shows the number of years for which 4 and 5 percent withdrawal rates are sustainable at various percentiles. In the worst case, all countries except Russia find 4 percent and 5 percent to be sustainable for at least 10 years. The number of sustainable years increases when a higher chance for failure is accepted. As well, there tends to be a large drop in the number of sustainable years when the withdrawal rate increases from 4 percent to 5 percent, especially for Brazil, Colombia, Chile, and South Africa.

// Figure 1 About Here //

Figure 1 shows the asset allocations that achieved the perfect foresight maximum sustainable withdrawal rates shown for Table 2. Interestingly, for most countries the optimums occur with a low proportion of stocks. This contrasts with the Pfau (2010) study for developed markets, which found that the stock allocation which provided the highest withdrawal rate was at least 50 percent in 16 of 17 countries. For the more volatile emerging market countries, from the minimums to the 10th percentiles of the simulations, the optimums occur with stock allocations below 30 percent for all countries except Chile, the Czech Republic, Egypt, Peru, and Mexico.

// Figure 2 About Here //

Figure 2 illustrates the distribution of sustainable withdrawal rates across stock allocations for each country with a 5 percent probability of failure. For each country's distribution, the highest withdrawal rate attained is labeled with the country's name code. In the case of ties, the smallest stock allocation is labeled. The highest withdrawal rates are achieved with 30 percent or less stock allocations for all countries except Chile, Peru and Mexico, where the highest withdrawal rates occur with 50, 55, and 80 percent stock allocations, respectively. Strikingly, 19 out of the 25 countries achieve the highest

sustainable withdrawal rates with stock allocations of 15 percent or less. The distribution of stock allocations has a downward sloping trend for many countries, noticeably when stock allocations rise above 20 percent. Allocating a high proportion to stocks does more harm than good for sustainable withdrawal rates in these emerging market countries.

// Figure 3 About Here //

Finally, Figures 3 and 4 show the probability of failures with 4 and 5 percent withdrawal rates, respectively, across the range of stock allocations. Again, for each country's distribution, the lowest probability of failure is labeled by the country's name code. The distributions of failure probabilities exhibit a convex shape (or roughly U-shaped) for many countries. This pattern is more apparent when the withdrawal rate is 5 percent. There is a large drop in the probability of failure when stocks are initially introduced, but the marginal drop decreases to a minimum. Then the failure probabilities increase for higher stock allocations

// Figure 4 About Here //

Moreover, the minimum probability of failure for a 4 percent withdrawal rate occurs at points where stock allocations are less than 50 percent for most countries, except Czech Republic, Mexico, Peru, and Russia. It is not surprising that when the withdrawal rate increases to 5 percent, minimum probabilities of failure move to higher stock allocations, since more risk is needed to fund higher withdrawals. Even though more stocks are needed to increase withdrawals to 5 percent, still only 6 countries experience optimal stock allocations of more than 50 percent. These results improve the robustness of our previous findings that, differently from developed countries, high stock allocations are not appropriate for maintaining sustainable withdrawals with emerging market assets.

Conclusion

Numerous studies based on U.S. data exist to help retirees plan safe and sustainable withdrawals from their retirement savings. In the existing literature, the well-known finding is that an annual 4 percent inflation-adjusted withdrawal rate over 30 years is considered safe for retirees with a stock allocation above 50 percent. However, this widely-accepted rule-of-thumb is not necessarily applicable for the situation in other countries. For emerging market economies, this issue is quite important, as annuity

markets are not developed and recent pension reforms are moving toward defined-contribution pension plans in which retirement income management is handled individually by retirees. Therefore, guidelines about sustainable withdrawal rates are needed.

Our study, based on a sample of 25 emerging market economies, finds that the sustainability of the 4 percent withdrawal rule is questionable in many cases. Using the bootstrapping approach, our results show that, in the worst-case scenario, only retirees in 6 out of 25 countries could sustain their 30 years of withdrawals with 4 percent. Even with a 5 percent chance of failure, 4 percent is not sustainable in 11 countries, and even 3 percent is not sustainable in 5 countries.

Moreover, our study indicates that the optimal asset allocation for providing the highest withdrawal rates with a low chance for failure occur at low stock allocations for most emerging market economies, in contrast to previous studies on developed economies. Though a higher proportion of stocks increases the chance of success at higher withdrawal rates, higher withdrawal rates are also accompanied by increased failure probabilities. To attain a 4 or 5 percent withdrawal rate, less than 50 percent of stocks are needed in the portfolio mix for most of the countries in our sample.

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Table 1: Summary Statistics

Country	Period	Real Stocks Returns		Real Fixed Income Returns		Inflation		Correlation between Stocks and Fixed Income assets
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	
Argentina	1992-2009	11.5	37.8	3.6	6.4	7.2	8.1	-0.15
Brazil	1995-2009	19.1	47.8	9.5	7.3	11.0	15.6	0.30
Chile	1988-2009	18.0	29.5	3.4	3.4	8.4	6.9	-0.09
China	1993-2009	4.7	45.9	-0.2	3.8	4.9	7.3	0.31
Columbia	1993-2009	18.7	41.3	4.4	3.4	11.6	7.2	-0.59
Czech Republic	1995-2009	11.7	30.4	-1.0	1.6	4.5	3.4	0.56
Egypt	1995-2009	30.0	62.6	1.3	5.3	7.3	5.0	0.09
Hungary	1995-2009	18.4	47.6	0.8	2.7	10.4	7.6	-0.23
India	1993-2009	13.9	39.8	1.2	2.6	6.8	3.0	0.04
Indonesia	1988-2009	23.9	67.3	4.6	5.9	11.2	11.1	0.09
Israel	1993-2009	8.9	30.2	2.8	2.8	5.0	4.3	0.34
Jordan	1988-2009	6.7	29.6	1.0	5.2	5.5	6.1	0.20
Korea	1988-2009	10.7	37.4	2.8	1.9	4.6	2.2	0.04
Malaysia	1988-2009	12.0	35.1	1.8	1.5	2.9	1.3	0.06
Mexico	1988-2009	18.6	34.6	-1.2	7.2	17.7	23.7	0.26
Morocco	1998-2009	7.9	22.8	2.6	1.6	1.9	1.1	-0.30
Pakistan	1993-2009	16.5	53.6	0.3	3.3	8.6	4.6	0.16
Peru	1993-2009	21.0	38.0	-0.4	7.0	8.3	11.9	0.04
Philippines	1988-2009	10.8	44.1	1.7	2.4	7.4	3.6	-0.08
Poland	1994-2009	2.0	34.3	2.1	2.2	9.4	9.9	-0.14
Russia	1995-2009	14.4	60.0	-9.9	11.5	34.2	49.4	0.19
South Africa	1993-2009	10.4	22.8	3.7	2.4	6.9	2.5	-0.06
Sri Lanka	1993-2009	12.7	55.8	-0.1	4.1	10.3	4.7	0.45
Thailand	1988-2009	15.1	51.0	2.5	2.9	3.8	2.3	0.07
Turkey	1988-2009	39.1	120.6	2.0	8.4	52.1	31.2	0.04

Source: Own calculations using data described in Data and Methodology section.

Table 2: Sustainable Withdrawal Rates

Country	Minimum	1st percentile	5th percentile	10th percentile	% Failure Within 30 years at 4% Withdrawal Rate	% Failure Within 30 years at 5% Withdrawal Rate
Brazil	5.00	6.23	7.08	7.59	0	0
Columbia	4.95	5.53	5.91	6.18	0	0
South Africa	4.40	4.81	5.10	5.30	0	3.2
Chile	4.34	5.05	5.93	6.66	0	0.9
Morocco	4.09	4.40	4.55	4.65	0	26.6
Korea	4.08	4.32	4.51	4.62	0	29.5
Israel	3.64	4.03	4.27	4.41	0.8	32.5
Poland	3.60	3.86	4.00	4.09	5.0	74.5
Malaysia	3.53	3.87	4.08	4.23	2.7	27.1
Thailand	3.35	3.92	4.22	4.39	1.7	26.7
Indonesia	3.26	4.19	4.90	5.36	0.6	5.9
Philippines	3.14	3.59	3.84	3.98	11.3	43.4
Argentina	3.06	3.78	4.29	4.60	2.1	18.8
Hungary	2.92	3.40	3.74	4.06	9.0	22.7
India	2.91	3.38	3.68	3.89	12.5	30.1
Pakistan	2.41	2.79	3.09	3.33	24.0	39.3
Czech Republic	2.38	2.58	2.83	3.21	19.4	30.0
Egypt	1.85	3.14	4.06	4.82	4.8	11.4
Peru	1.84	3.09	4.19	5.17	4.0	9.3
Jordan	1.81	2.53	2.93	3.18	34.5	54.9
China	1.80	2.37	2.62	2.75	65.1	78.1
Sri Lanka	1.73	2.34	2.65	2.82	40.5	55.5
Turkey	1.62	2.55	3.23	3.73	13.4	25.8
Mexico	1.39	2.62	3.91	5.02	5.4	9.9
Russia	0.06	0.17	0.30	0.41	74.1	78.8

Note: Assumptions include perfect foresight, a 30-year retirement duration, no administrative fees, annual inflation adjustments, and annual rebalancing. Results are based on 10,000 simulations using bootstrapping with replacement.
Source: Same as Table 1.

Table 3: Number of Sustainable Years for Various Withdrawal Rates

Country	4% Withdrawal Rate				5% Withdrawal Rate			
	Minimum	1st percentile	5th percentile	10th percentile	Minimum	1st percentile	5th percentile	10th percentile
Brazil	>50	>50	>50	>50	29	>50	>50	>50
Columbia	>50	>50	>50	>50	29	44	>50	>50
Chile	36	>50	>50	>50	24	33	>50	>50
South Africa	35	47	>50	>50	24	29	33	37
Korea	31	35	38	40	23	25	26	27
Morocco	31	36	38	40	23	25	27	27
Israel	27	31	34	36	20	23	24	26
Poland	26	29	30	31	20	22	23	23
Malaysia	25	29	32	34	20	22	23	24
Thailand	24	30	34	37	19	22	24	26
Indonesia	23	38	>50	>50	18	24	33	46
Philippines	23	27	29	31	18	20	22	23
Argentina	22	29	38	46	17	21	26	29
Hungary	22	25	28	31	18	20	21	23
India	21	25	28	30	17	20	21	22
Czech Republic	19	20	21	23	16	17	17	18
Pakistan	19	21	23	25	15	17	18	20
Peru	16	23	37	>50	13	17	23	38
Sri Lanka	16	19	21	22	13	15	17	18
China	15	19	20	21	13	15	17	17
Egypt	15	23	33	>50	13	17	22	29
Jordan	15	20	23	24	13	16	18	19
Turkey	14	19	24	29	12	15	18	21
Mexico	12	18	31	>50	10	14	20	32
Russia	6	9	10	11	6	8	9	10

Note: - Assumptions include perfect foresight, no administrative fees, annual inflation adjustments for withdrawals, and annual rebalancing.
   - >50 means at least 50 years of sustainability
Source: Same as Table 1.

Figure 1: Asset Allocation Providing Maximum Sustainable Withdrawal Rate for Various Failure Probabilities
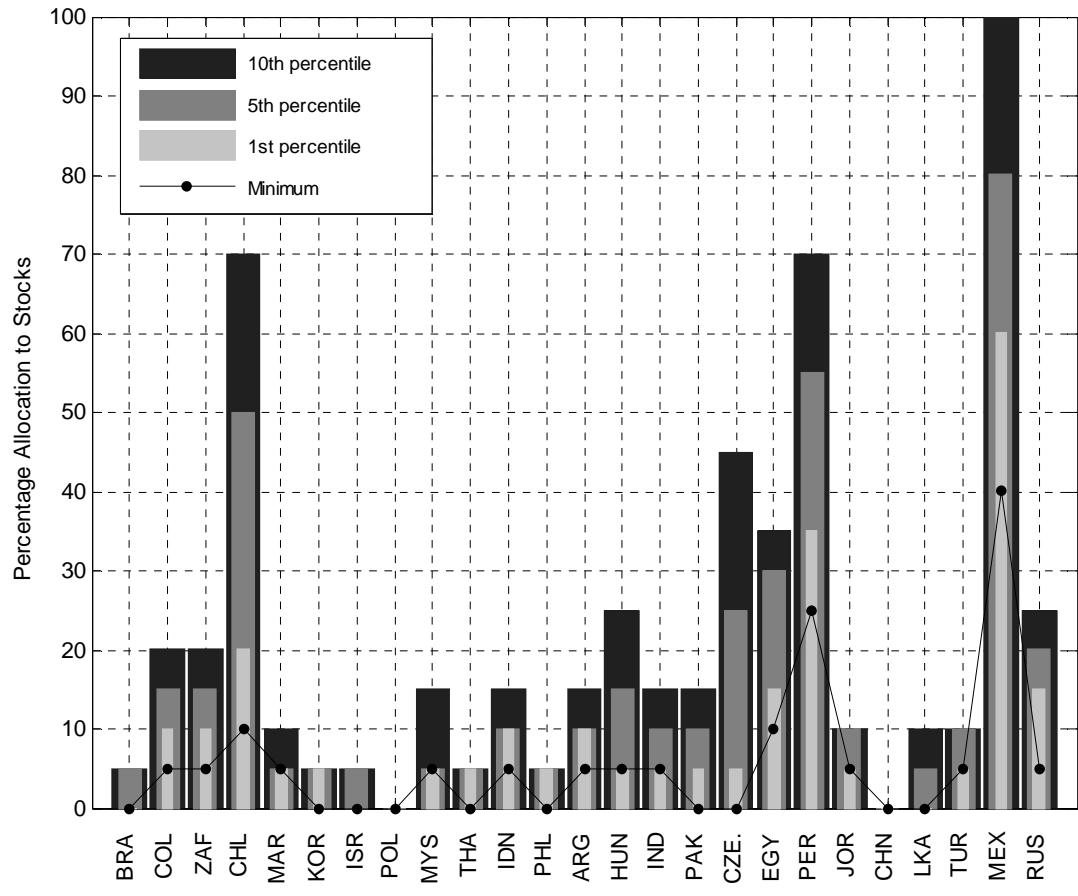
Figure 2: Sustainable Withdrawal Rates across Distribution of Stock Allocations with 5 Percent Failure Probability
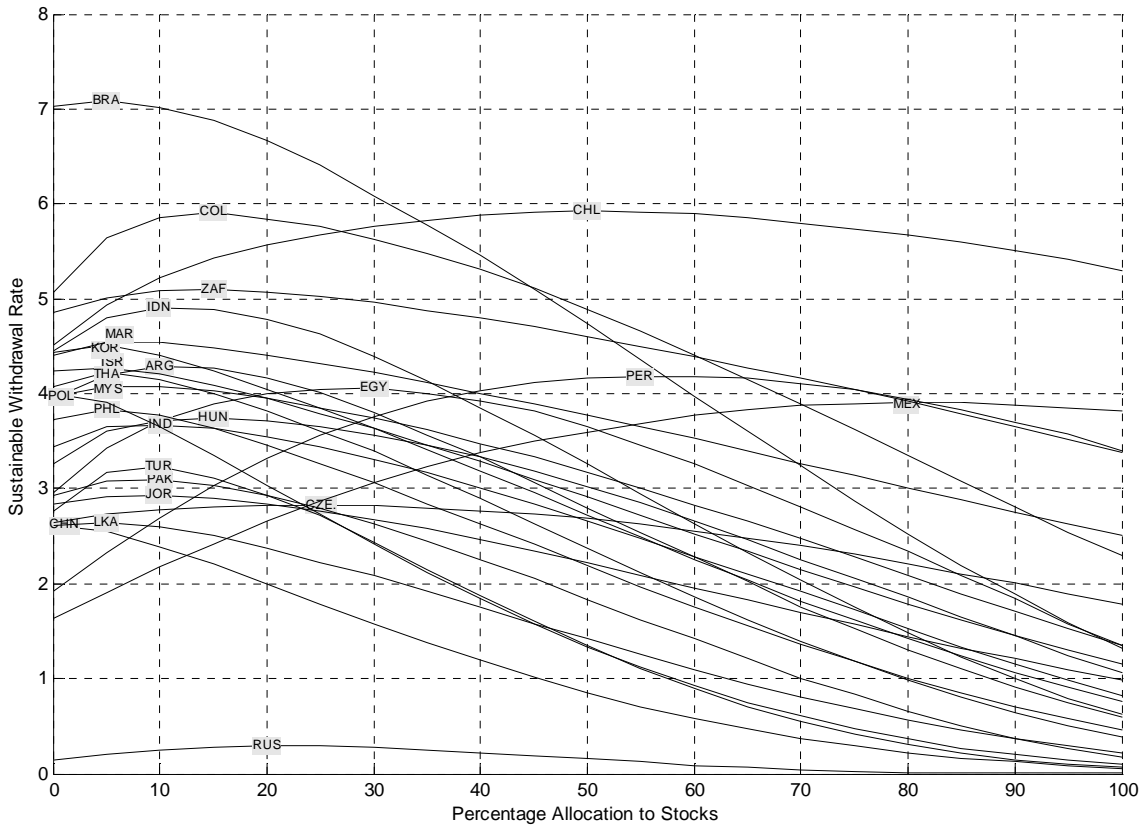
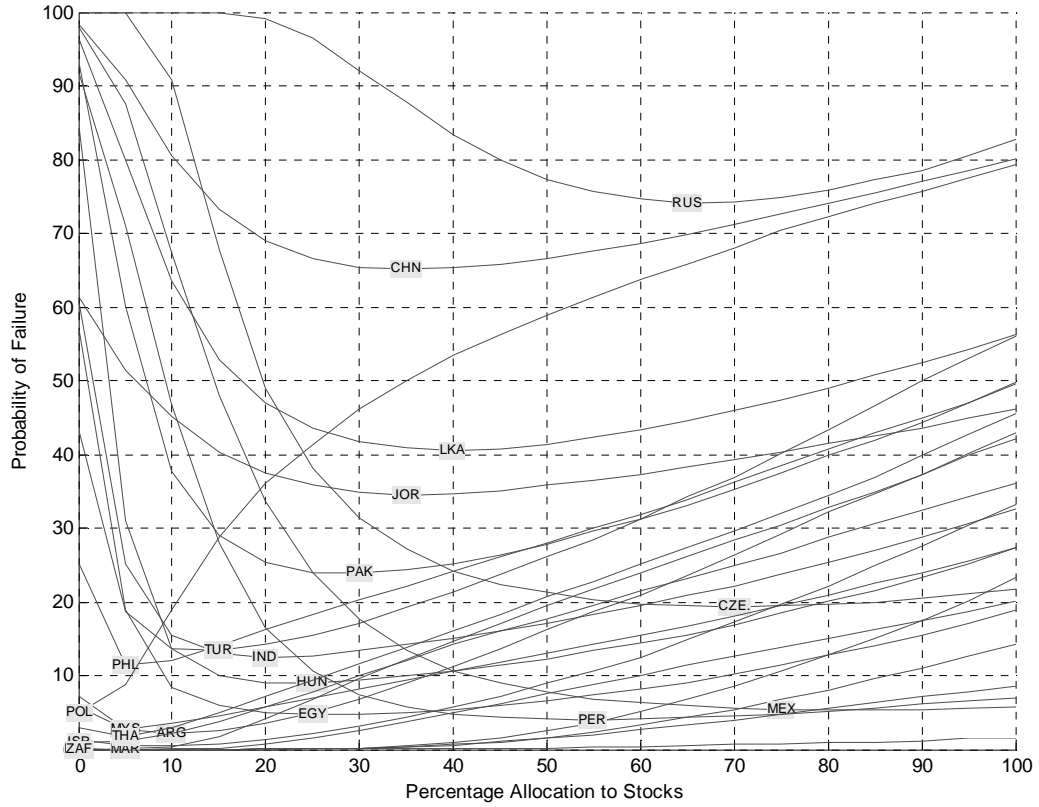**Figure 3: Probability of Failure for 4% Withdrawal Rate
by Stock Allocation**

**Figure 4: Probability of Failure for 5% Withdrawal Rate
by Stock Allocation**