

STRATEGIC ASSET ALLOCATION IN A SMALL OPEN ECONOMY: EVIDENCE FROM ICELAND, 1992–2024

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Abstract. This paper examines the long-term strategic asset allocation of investors in small open economies, where the domestic financial markets are limited, unstable and vulnerable to significant country-specific shocks. Iceland is used as a case study. All wealth, risk and portfolio outcomes are evaluated in Icelandic krona (ISK). The analysis covers the period from 1992 to 2024, including financial liberalisation, the 2008 banking collapse, years of capital controls, and the subsequent tourism-led recovery. The study considers the following eight asset classes, which are available to Icelandic investors and constitute a realistic investable universe: These are Icelandic government bonds; a short-term, risk-free ISK asset; Icelandic equities; global, developed-market equities (MSCI World); emerging-market equities (MSCI Emerging Markets); US Treasury bills; UK government bonds; and gold. As foreign assets are held unhedged, returns reflect both asset-price movements and exchange-rate changes. Using annual data, the paper first documents the long-term risk and return characteristics of each asset in ISK terms. This includes arithmetic and geometric mean returns, volatility, correlations and behaviour during periods of crisis. It then applies a standard long-only mean–variance framework to characterise efficient portfolios for an ISK-based investor with a long time horizon. The results show that, despite high average one-year returns, domestic equities perform poorly in the long run. The collapse of 2008, in particular, drives their real geometric mean return below zero over the full sample due to extreme downside risk. In contrast, global equities deliver the strongest and most stable long-term growth in ISK, achieving the highest risk-adjusted performance. Foreign safe assets and gold offer robust protection during years of severe currency depreciation, but their average excess returns are insufficient for them to play a pivotal role in long-term efficient portfolios. Consequently, the efficient frontier is reduced to a combination of domestic government bonds, the risk-free ISK asset and global equities, with domestic equities and other foreign assets being largely excluded. The findings emphasise the significant expense of home bias in small, open economies with independent currencies. In the long term, achieving portfolio efficiency requires meaningful exposure to global equity markets, anchored by high-quality domestic bonds rather than heavy reliance on domestic equities.

Keywords: strategic asset allocation, small open economy, international diversification, currency risk, home bias.

JEL Classification: G11, G15, F31

1. Introduction

For long-term investors, strategic asset allocation is a key decision. In small open economies, this decision is influenced not only by the traditional risk–return trade-off, but also by factors such as limited domestic markets, vulnerability to country-specific shocks and significant currency risk. Iceland is a clear example of this. Its domestic equity and bond markets are small and concentrated. The macroeconomic environment has been volatile. The Icelandic krona (ISK) exchange rate has fluctuated significantly, with the currency collapsing in 2008. Similar features can be found in many other small open economies with

independent currencies, including several non-euro European countries and emerging markets. In such contexts, purely domestic portfolios expose investors to significant and poorly diversified risks.

Between 1992 and 2024, Iceland experienced financial liberalisation, rapid credit growth, a complete banking collapse, the introduction and removal of capital controls, and significant changes to monetary and exchange rate regimes. Domestic financial markets expanded and collapsed before being rebuilt. Meanwhile, access to global markets improved through foreign equity indices, foreign government bonds and commodities. Both local conditions and global

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shocks were reflected in the ISK risk-free curve and the exchange rate. For an investor measuring wealth and consumption in ISK, this period provides a comprehensive record of how domestic and foreign assets behave under different regimes. Nevertheless, there is little systematic evidence regarding long-term strategic asset allocation from the perspective of an ISK-based investor with access to both domestic and global assets. The international asset allocation literature typically uses the US dollar or euro investor as the benchmark. Studies of small open economies often use shorter time periods, focus on specific crises or limit the investable universe. In Iceland, most research has centred on institutional investors, particularly pension funds, and on specific events such as the 2008–2009 crisis. The implications for a long-term investor investing in a realistic range of domestic and foreign assets and evaluating outcomes in ISK remain under-documented.

This paper addresses this issue by analysing the long-term asset allocation problem for an Icelandic investor using annual data from 1992 to 2024. The base currency is ISK. The investable universe comprises eight asset classes, all expressed in ISK terms: Icelandic government bonds, a short-term risk-free ISK asset, Icelandic equities, MSCI World equities, MSCI Emerging Markets equities, US Treasury bills, long-term UK government bonds (gilts) and gold. Foreign assets are first measured in their local currencies and then converted into ISK returns so that asset price movements and exchange rate changes are taken into account directly. In practice, access to certain foreign assets was sometimes restricted by regulations and capital controls. The baseline analysis disregards these frictions, but later considers two subperiods that reflect key institutional changes.

The first research question is descriptive: what are the risk and return properties of these domestic and international assets when measured in ISK over a period of more than three decades? The analysis documents the arithmetic and geometric mean returns, volatility, co-movements and behaviour during periods of crisis. Particular attention is paid to the difference between the arithmetic and geometric mean returns, which is significant for volatile assets such as Icelandic equities. The role of exchange rate movements in producing extreme ISK outcomes for foreign assets is also examined. The second research question is normative: how should an Icelandic investor with a long-term perspective allocate their wealth across these eight asset classes? This paper employs a standard mean–variance framework with annual data and fully invested, long-only portfolios. Portfolios are evaluated in ISK and efficient frontiers are constructed for different subsets of assets. Due to the short time series relative to the number of assets, the optimisation is interpreted cautiously.

The main finding is that efficient long-run portfolios for an ISK-based investor simplify to a mix of domestic government bonds, risk-free Icelandic assets and global equities once realistic foreign assets are available. Domestic equities, foreign safe assets and gold play at most a limited role. This reflects the weak compounded performance and high volatility of domestic equities, as well as the fact that foreign safe assets deliver strong payoffs mainly during years of crisis driven by currency depreciation, rather than sustained high returns. Although the empirical work uses Iceland as a case study, the mechanisms are more widely applicable. These mechanisms are relevant to investors and policymakers in other small open economies, where domestic markets are limited and currencies can fluctuate significantly during periods of stress.

The rest of the paper is organised as follows: Section 2 provides the institutional background. Section 3 reviews the literature on international portfolio choice, home bias and asset allocation in small open economies. Section 4 describes the data and methodological framework, including the mean–variance approach and portfolio constraints. Section 5 presents the empirical results on asset properties, efficient frontiers and optimal portfolios. Section 6 discusses the findings and their implications for investors. Section 7 concludes.

2. Institutional Background

Iceland is a small, open economy with around 390,000 inhabitants and a gross domestic product (GDP) of approximately 35 billion USD (Statistics Iceland, 2025). It has its own currency, the Icelandic króna. For much of the post-war period, the country was characterised by high and variable inflation, recurrent currency devaluations and a narrow production base, which was first dominated by fisheries and later by energy-intensive aluminium production. These features hindered the development of private capital markets and, by advanced-economy standards, made macroeconomic conditions volatile. Over time, inflation was brought down, and a formal inflation target of 2.5 per cent was introduced. However, inflation shocks and exchange-rate fluctuations remained frequent, particularly around business-cycle turning points.

From the mid-1990s to the mid-2000s, financial liberalisation and Iceland's participation in the European Economic Area (EEA) allowed Icelandic banks and firms to access international funding on a much larger scale. The EEA framework opened the domestic financial sector to European markets, strengthened legal and regulatory integration, and facilitated borrowing abroad and rapid expansion for Icelandic institutions. This combination of domestic deregulation and external market access was a key driver of the

sharp rise in cross-border capital flows, contributing to a substantial current account deficit. Short-term interest rates in Iceland were often significantly higher than in the euro area and the United Kingdom. Alongside a small and illiquid foreign-exchange market, this made the króna a popular currency for carry trades: foreign investors borrowed in low-yield currencies and invested in ISK assets to take advantage of the interest rate differential. While these capital inflows supported the exchange rate and financed a rapid domestic credit boom and widening current account deficit, they also left the króna highly vulnerable to shifts in global risk appetite and funding conditions (Gylfason & Zoëga, 2018).

These vulnerabilities ultimately led to the 2008 financial crisis. The three large cross-border banks, whose combined balance sheets had reached more than nine times Icelandic GDP, lost access to wholesale funding and defaulted in rapid succession within a single week in October 2008 (Benediktsdóttir et al., 2017; George, 2024). The banking collapse precipitated a precipitous depreciation of the ISK, a decline of more than 90 per cent in the market capitalisation of the domestic stock exchange from its zenith, and a cumulative decline in real GDP of approximately 10 per cent between 2007 and 2010 (Statistics Iceland, 2025). For an investor with a portfolio dominated by domestic banks, this episode resulted in near-total losses, while those with foreign-heavy equity portfolios experienced significant ISK gains, primarily driven by the devaluation of the currency rather than by exceptional returns in foreign markets. For instance, the USD/ISK rate increased from 61.25 at the end of 2007 to 123.99 one year later (Central Bank of Iceland, 2025). In response to the economic downturn, the authorities implemented a series of measures to stabilise the financial sector. These included guarantees for domestic deposits, the imposition of comprehensive capital controls, and a restructuring of the banking system. The old banks defaulted, and new, domestically focused banks were created to take over local operations, while the old institutions were placed in resolution and tasked with winding down foreign activities (Benediktsdóttir et al., 2017). A programme of economic adjustment was initiated with the support of the IMF. This programme combined fiscal consolidation, changes in monetary policy and the use of capital controls with a view to stabilising the exchange rate and enabling gradual repair of the balance sheet. Comprehensive capital controls were first implemented on residents and non-residents in late 2008, and were gradually eased until being fully lifted in March 2017 (Edwards, 2019).

From around 2012 onwards, Iceland entered a new recovery phase. Tourism expanded rapidly, supported by a weaker real exchange rate, improved international flight connections, and increased global visibility–

including following the eruption of Eyjafjallajökull in 2010 – and through social media (Macheda & Nadalini, 2019). Tourism receipts grew to become the largest export category by far. By 2017, it accounted for 42% of the country's exports, compared to 17% for seafood and 16% for aluminium (Statistics Iceland, 2025). This shift helped to improve the current account, rebuild foreign reserves and reduce net external liabilities. Although private balance sheets remained heavily affected by the crisis, inflation declined from crisis peaks, interest rates fell from double-digit levels and public finances improved. As the external position strengthened and the risks from 'trapped' foreign capital diminished, capital controls were unwound step by step.

3. Literature Review

This paper begins with Markowitz's modern portfolio theory, which formalises the trade-off between the expected return and the variance of portfolio returns. Within this framework, optimal portfolios are located on an efficient frontier, which is constructed using the means, variances and covariances of asset returns (Markowitz, 1952). Both Tobin (1958) and Sharpe (1964) extend this analysis to demonstrate how a risk-free asset and a market portfolio of risky assets can generate a linear capital market line. Merton (1969) generalised the problem by applying it to dynamic, continuous-time settings and investors with inter-temporal consumption and labour income. These foundational contributions provide the toolkit used in this paper to study optimal portfolios for an Icelandic investor.

A second strand of literature emphasises the benefits of international diversification. Early studies, such as those by Grubel (1968), Levy and Sarnat (1970) and Solnik (1974), demonstrate that holding foreign equities can enhance the risk–return trade-off because the correlations between national markets are lower than one. Subsequent research has confirmed that global diversification can reduce portfolio variance for a given expected return, although the extent of this reduction varies across periods and regions (Fama & French, 1998; Harvey, 1995; Santis & Gérard, 1997). The development of broad indices such as the MSCI World Index and the MSCI Emerging Markets Index has made such diversification easier to implement in practice.

However, international diversification also introduces currency risk. When the investor's base currency differs from that of the underlying assets, the return in the investor's domestic currency combines the return on the local-currency assets with the change in the exchange rate. Adler and Dumas (1983) demonstrate that the optimal choice of portfolio for an international investor must explicitly consider currency exposure.

Subsequent research has examined whether currency risk commands a distinct risk premium and how investors should manage it (e.g., Campbell et al., 2010). For a small open economy with a volatile exchange rate, such as Iceland, this issue is particularly important. Edwards and Cabezas (2022) emphasise the significant impact of exchange rate fluctuations on domestic prices and the volatility of the Icelandic króna in response to shocks.

Related literature has studied the "home bias" puzzle, whereby investors hold a much larger proportion of domestic assets than standard models would suggest. Tesar and Werner (1995) found evidence of a strong home bias in equity portfolios. Lewis (1999) and Coeurdacier and Rey (2013) propose various explanations for this phenomenon, such as information frictions, regulation, and macroeconomic risk. Home bias is particularly costly for small open economies with narrow domestic markets because domestic assets are highly exposed to country-specific shocks.

The Iceland-specific literature has mainly focused on institutional investors, particularly pension funds. Rúnasson and Arnarsdóttir (2009), Björnsdóttir and Eiríksson (2018), and Kristinsson (2019) employed mean-variance methods to compare actual and efficient portfolios and identified significant potential gains from increased foreign equity exposure. However, all of these studies are theses rather than peer-reviewed papers, and each one covers only a short time period. Magnússon and Sigurðsson (2023) provide the most systematic evidence to date. Using data from 1993 to 2021 and covering a wide range of domestic and foreign asset classes, they demonstrate that including foreign securities in a portfolio improves the historical return-risk ratio for Icelandic investors compared to a purely domestic portfolio. They also show that foreign assets reduce the likelihood of extreme negative outcomes.

This paper builds upon the work of Magnússon and Sigurðsson (2023) in a number of ways. Firstly, it employs yearly data from a longer timeframe (1992–2024) than previous studies. This period encompasses financial liberalisation, the pre-crisis boom, the 2008 banking collapse and capital controls, as well as the subsequent normalisation and tourism-driven recovery. Secondly, a different asset mix is used, focusing on eight specific, liquid asset classes that an ISK-based investor can actually hold, with all returns consistently measured in ISK. This differs from the approach taken by Magnússon and Sigurðsson (2023), who also include several unlisted asset classes. Thirdly, it maintains a focus on the relationship between international diversification and currency risk by analysing portfolios with varying levels of foreign assets and associated currency exposure. However, the Magnússon and Sigurðsson (2023) paper

is written in Icelandic and published in a domestic journal, limiting its visibility within the broader academic community. This paper presents an English-language, ISK-based study of long-run strategic allocation in a small open economy. This makes the Icelandic evidence more accessible and links it directly to the international literature on portfolio choice, currency risk, and home bias.

4. Methodology and Data

The empirical analysis is conducted from the perspective of a long-term Icelandic investor who measures wealth and risk in Icelandic króna (ISK) and rebalances the portfolio once per year. This investor is risk-averse and is concerned with long-term growth in purchasing power. The model focuses on assets only. Explicit liabilities, taxes, transaction costs and management fees are excluded from the baseline. These simplifications keep the framework close to standard portfolio theory, allowing a direct link to be established between observed returns and portfolio outcomes.

This research focuses on eight asset classes that could realistically be held by Icelandic investors between 1992 and 2024. These are: Icelandic government bonds, measured by indices of long-term government bonds; a short-term ISK risk-free asset, proxied by the three-month REIBID rate from 1998 onwards, with a similar short-term risk-free measure constructed for earlier years using Central Bank of Iceland data; Icelandic equities, represented by the OMX Iceland 15 index from 2009, with the earlier Úrvalsvisitalan index used for listed equities before that; global developed-market equities, proxied by the MSCI World Index, which covers large- and mid-cap stocks in developed economies; emerging-market equities, proxied by the MSCI Emerging Markets Index, which covers large- and mid-cap stocks in major emerging economies; three-month US Treasury bills; ten-year UK government bonds; and gold. Returns are measured at yearly frequency. This aligns with the paper's long-term focus, mitigates high-frequency noise and aligns with the infrequent rebalancing of many strategic investors. Domestic bond and money-market data are sourced from the Central Bank of Iceland and domestic index providers. Equity indices, foreign bond returns, and gold prices are sourced from Bloomberg.

For foreign assets, the study first calculates the returns in the local currency, before converting them into ISK. The ISK return in year t reflects two factors: the asset's return in its local currency and the percentage change in the ISK value of that currency. If the krona depreciates, the ISK value of the foreign asset increases, even if its price in the local currency remains unchanged. Conversely, if the krona appreciates, the ISK return on the same foreign asset

decreases. This research assumes that there is no currency hedging. From the perspective of an ISK investor, all foreign assets are fully unhedged. This conversion step is crucial. Several extreme ISK outcomes, such as the high returns on foreign safe assets and gold in 2008, are mainly driven by exchange rate movements rather than large price changes in foreign markets.

Descriptive statistics are constructed using yearly nominal ISK returns for each asset. Two average returns are reported. The arithmetic mean is the simple average of the annual returns over the sample period, and corresponds to the 'expected one-year return' in standard portfolio theory. The geometric mean is the constant annual return that would generate the same terminal wealth as the actual sequence of returns. This is obtained by compounding all yearly returns, taking the appropriate root and subtracting one. The geometric mean is the most appropriate measure of long-term growth for a buy-and-hold investor. Due to the volatility of returns, the actual return is always below the arithmetic mean, sometimes by a significant margin when substantial losses occur. Real returns are calculated by adjusting nominal ISK returns using Iceland's consumer price index (CPI), meaning real performance is always measured in terms of domestic purchasing power.

Risk is measured by the standard deviation of annual returns. The variance–covariance matrix of returns is also estimated, along with the associated correlation matrix. The covariance matrix summarises how assets move together over time and underpins the correlation patterns reported later. Positive covariance indicates that assets tend to move in the same direction, while negative covariance suggests that gains in one asset tend to coincide with losses in another. These co-movements are crucial for understanding diversification benefits, especially between domestic equities, foreign safe assets and global equities. In order to facilitate a comparison of risk-adjusted performance, Sharpe ratios are reported. The Sharpe ratio of an asset is defined as its average yearly excess return over the domestic risk-free rate, divided by its standard deviation of yearly returns. The metric calculates the excess return an investor has received, on average, for each unit of risk. In accordance with the principles of mean-variance theory, the Sharpe ratio utilises the arithmetic mean excess return, as opposed to the geometric mean. In the context of volatile assets, the one-year risk-adjusted performance can be rendered superior to long-term compounded outcomes. This distinction is of significance when interpreting the Icelandic equity results.

The core portfolio analysis employs a standard mean-variance optimisation to delineate the efficient frontier: the set of portfolios that offer the highest expected return for each level of risk. The inputs to

the model are the mean returns of the eight assets and their variance–covariance matrix. Portfolios are characterised by their comprehensive investment and long-only nature, where the weights add up to one, no weight is negative, and the presence of leverage and short selling is excluded. These constraints are indicative of the practical limits facing many investors in small open economies and shape which assets can appear in efficient portfolios.

The efficient frontier is constructed by selecting target expected returns and then finding the portfolio with the lowest possible standard deviation that meets these criteria. As target returns increase, the optimiser shifts weight from safer, low-return assets towards riskier, higher-return ones, in line with historical averages and the covariance structure. With only 33 annual observations for eight assets, average returns are estimated imprecisely. Therefore, the focus is on clear, robust patterns, such as the central role of global equities and domestic government bonds, and the limited contribution of domestic equities, rather than precise portfolio weights, when interpreting the portfolio results.

5. Results

The results are summarised in four tables. Table 1 provides full-sample statistics for the eight asset classes between 1992 and 2024. Table 2 divides the sample into pre- and post-crisis periods. Table 3 presents the correlation matrix of yearly ISK returns. Table 4 reports the long-only efficient frontier.

Over the full sample (see Table 1), the dominant asset is MSCI World in ISK. It has a nominal geometric mean of around 11.5%, with a real geometric mean of 7.0%, which is the highest of all the assets. Gold and the MSCI Emerging Markets index also performed strongly, with nominal geometric means of 9.3% and 8.8%, and real geometric means of 4.8% and 4.3% respectively. However, they were more volatile than the MSCI World index. UK gilts are positioned between domestic government bonds and global equities. Their nominal and real geometric means are 7.4% and 3.0% respectively, and while the risk is higher than that of Icelandic government bonds, it is lower than that of emerging-market equities. Icelandic government bonds themselves provide solid long-term returns with low risk (8.0% nominal and 3.6% real with a standard deviation of 5.4%). Domestic equities are the weakest long-term asset, with a nominal geometric mean of 3.0%, a negative real geometric mean of -1.2% and a standard deviation of 31.0%. The 94.4% loss in 2008 destroyed compounded performance, despite a high nominal arithmetic mean of 12.0%.

Both risk and risk-adjusted performance are tilted towards global equities. MSCI World has the highest Sharpe ratio in the sample (0.37) and a standard

deviation of 15.3%. Gold and the MSCI Emerging Markets index achieve Sharpe ratios of 0.18 and 0.17 respectively, which are comparable to those of domestic equities (0.16), but offer higher long-term real returns. UK gilts offer a modest Sharpe ratio of 0.10; while they add value in ISK, they do not match the risk–return profile of the MSCI World Index. The Sharpe ratio of US Treasury bills in ISK is slightly negative (−0.01), as their volatility is not offset by excess returns over the ISK risk-free asset. The most extreme observations are concentrated in 2008, when Icelandic equities fell by 94.4%, while the returns on gold, US Treasury bills and UK gilts were 107.8%, 101.9% and 68.9% respectively in ISK terms. These FX-driven spikes demonstrate the effectiveness of foreign safe assets and gold in hedging domestic tail risk, despite their modest average excess returns.

Table 2 shows that splitting the sample in half does not alter the fundamental narrative. Between 1992 and 2008, the nominal geometric mean of domestic equities was slightly negative (−0.6%), while the real geometric mean was strongly negative (−4.6%), with very high volatility (39.3%). In ISK, foreign assets appear extremely strong: UK gilts have a nominal geometric mean of 12.8%, the highest Sharpe ratio of 0.28, and MSCI World and gold have nominal geometric means of approximately 10.3–10.4% and real geometric means of 5.9%. Meanwhile, Icelandic government bonds deliver a stable nominal geometric mean of 9.2%, with low volatility of 5.0%.

From 2009 to 2024, the domestic macro-financial environment was calmer, but the ranking remained largely unchanged. Domestic equities have recovered and now show nominal and real geometric means of 6.9% and 2.5% respectively, with volatility of 19.2% and a modest Sharpe ratio of 0.18. The MSCI World index performed best, with nominal and real geometric means of 12.8% and 8.1% respectively, and a Sharpe ratio of 0.65. Both gold and the MSCI Emerging Markets index performed well, with nominal geometric means

of around 8% and positive real returns. In contrast, the advantage of foreign safe assets driven by the crisis is lost. US Treasury bills and UK gilts recorded low nominal geometric means (2.1% and 2.0%, respectively) and negative real geometric means (−2.2%, respectively) during this period. While they remain useful as crisis hedges, they do not contribute to long-term growth.

Table 3 shows the correlation matrix for annual ISK returns from 1992 to 2024. The structure is strongly influenced by movements in the exchange rate because all foreign assets are converted into ISK. In ISK terms, foreign safe assets (US Treasury bills, gold and UK gilts) are highly correlated with each other and move strongly against risky ISK exposures in years when the króna depreciates sharply. The correlation between Icelandic equities and the MSCI World Index is close to zero (0.08), indicating that domestic equity risk is largely driven by local factors, while the common component across foreign assets mainly stems from currency translation. MSCI World and MSCI Emerging Markets are positively correlated (0.54), reflecting both global equity co-movement and the shared effect of the ISK currency. Domestic government bonds are positively correlated with foreign bonds, the Icelandic risk-free asset and gold, with correlations ranging from around 0.38 to 0.55.

Table 4 shows the long-only, fully invested efficient frontier, which is based on historical mean returns and the full-sample covariance matrix. Portfolios with target returns of 5.5–6.5 per cent are inefficient as they are outperformed by higher-return portfolios with equal or lower risk. The efficient set effectively begins at a target return of 7.0 percent, at which point volatility (2.6 percent) is already lower than that of the 6.5 percent portfolio. Along the efficient frontier, the structure is straightforward. With a target return of 7.0–8.0 percent, portfolios are still dominated by the ISK risk-free asset and Icelandic government bonds, with only minor allocations to domestic equities and the MSCI World index. As the target

Table 1

Summary statistics for eight asset classes, full sample 1992–2024 (ISK)

Asset class	Nominal geometric mean	Real geometric mean	Nominal arithmetic mean	Standard deviation	Sharpe ratio	Maximum yearly return (year)	Minimum yearly return (year)
Icelandic gov. bonds	8.0%	3.6%	8.2%	5.4%	0.22	22.3% (2008)	−4.2% (2022)
ISK risk-free (REIBID)	6.9%	2.6%	7.0%	3.2%	0.00	15.3% (2008)	1.2% (2021)
Icelandic equities	3.0%	−1.2%	12.0%	31.0%	0.16	64.7% (2005)	−94.4% (2008)
MSCI World (ISK)	11.5%	7.0%	12.7%	15.3%	0.37	40.9% (1993)	−35.8% (2002)
US T-bills (ISK)	5.3%	1.0%	6.7%	20.1%	−0.01	101.9% (2008)	−19.0% (2002)
Gold (ISK)	9.3%	4.8%	11.3%	23.1%	0.18	107.8% (2008)	−32.8% (2013)
MSCI Emerging Markets (ISK)	8.8%	4.3%	11.4%	25.4%	0.17	80.6% (2009)	−27.5% (1998)
UK gilts 10y (ISK)	7.4%	3.0%	8.7%	17.6%	0.10	68.9% (2008)	−23.1% (2022)

Source: author's calculations based on Nasdaq Iceland indices, Central Bank of Iceland, Bloomberg (for international assets), and official exchange rates

Table 2
Summary statistics by subperiod, 1992–2008 and 2009–2024 (ISK)

Asset	Period	Nominal geometric mean	Real geometric mean	Nominal arithmetic mean	Standard deviation	Sharpe ratio
Icelandic gov. bonds	1992–2008	9.2%	4.8%	9.3%	5.0%	0.10
Icelandic gov. bonds	2009–2024	6.9%	2.4%	7.0%	5.7%	0.33
ISK risk-free (REIBID)	1992–2008	8.7%	4.3%	8.8%	2.7%	0.00
ISK risk-free (REIBID)	2009–2024	5.1%	0.7%	5.1%	2.6%	0.00
Icelandic equities	1992–2008	-0.6%	-4.6%	15.3%	39.3%	0.17
Icelandic equities	2009–2024	6.9%	2.5%	8.5%	19.2%	0.18
MSCI World (ISK)	1992–2008	10.3%	5.9%	11.8%	17.5%	0.17
MSCI World (ISK)	2009–2024	12.8%	8.1%	13.6%	13.1%	0.65
US T-bills (ISK)	1992–2008	8.5%	4.1%	10.9%	26.7%	0.08
US T-bills (ISK)	2009–2024	2.1%	-2.2%	2.4%	7.7%	-0.36
Gold (ISK)	1992–2008	10.4%	5.9%	13.0%	28.5%	0.15
Gold (ISK)	2009–2024	8.1%	3.6%	9.4%	16.3%	0.27
MSCI Emerging Markets (ISK)	1992–2008	9.9%	5.4%	13.0%	27.6%	0.15
MSCI Emerging Markets (ISK)	2009–2024	7.6%	3.2%	9.6%	23.5%	0.19
UK gilts 10y (ISK)	1992–2008	12.8%	8.2%	14.2%	19.5%	0.28
UK gilts 10y (ISK)	2009–2024	2.0%	-2.2%	3.0%	13.8%	-0.16

Source: author’s calculations based on Nasdaq Iceland indices, Central Bank of Iceland, Bloomberg (for international assets), and official exchange rates

Table 3
Correlation matrix of yearly ISK returns, eight asset classes, 1992–2024

Asset	Icelandic gov. bonds	ISK risk-free (REIBID)	Icelandic equities	MSCI World (ISK)	US T-bills (ISK)	Gold (ISK)	MSCI Emerging Markets (ISK)	UK gilts 10y (ISK)
Icelandic gov. bonds	1.00	0.39	-0.27	0.17	0.38	0.50	0.23	0.55
ISK risk-free (REIBID)	0.39	1.00	-0.45	-0.03	0.49	0.50	0.17	0.43
Icelandic equities	-0.27	-0.45	1.00	0.08	-0.66	-0.61	0.17	-0.46
MSCI World (ISK)	0.17	-0.03	0.08	1.00	0.24	0.24	0.54	0.38
US T-bills (ISK)	0.38	0.49	-0.66	0.24	1.00	0.78	-0.05	0.76
Gold (ISK)	0.50	0.50	-0.61	0.24	0.78	1.00	0.23	0.66
MSCI Emerging Markets (ISK)	0.23	0.17	0.17	0.54	-0.05	0.23	1.00	0.00
UK gilts 10y (ISK)	0.55	0.43	-0.46	0.38	0.76	0.66	0.00	1.00

Source: author’s calculations based on Nasdaq Iceland indices, Central Bank of Iceland, Bloomberg (for international assets), and official exchange rates

return increases, the weighting shifts from the ISK risk-free asset to Icelandic government bonds and the MSCI World index, with the weighting in domestic equities decreasing to zero. For target returns of 8.5–10.0 percent, efficient portfolios use only Icelandic government bonds, the ISK risk-free asset and the MSCI World index. For target returns of 9.5 percent and above, the risk-free asset disappears as well. Other assets, such as US T-bills, UK gilts, gold and the MSCI Emerging Markets index, are never held. In practice, the frontier is spanned by a mix of two or three assets, with Icelandic government bonds acting as the anchor and MSCI World acting as the sole growth asset.

As a robustness check, the efficient frontier was recomputed using mean returns estimated from the second half of the sample period (2009–2024), during which time domestic equities exhibited substantially

stronger average performance. This was done while retaining the full-sample variance–covariance matrix. The resulting efficient frontier is almost identical to the baseline case: portfolios continue to be dominated by Icelandic government bonds and MSCI World equities. The ISK risk-free asset is only relevant at lower target returns and domestic equities remain largely excluded. This finding lends weight to the conclusion that the main portfolio results are not solely driven by poor equity performance during the crisis period or by extreme observations in the first half of the sample.

Taken together, the results clearly show what has and has not worked for an ISK-based investor between 1992 and 2024. Domestic equities are simply not a reliable asset for long-term growth: extremely high volatility and the collapse in 2008 drive their real geometric mean below zero, meaning a buy-and-hold investor will lose purchasing power despite strong

Table 4

Efficient frontier portfolios, eight asset classes, 1992–2024 (long-only, fully invested)

Expected return	Std. dev.	Icelandic gov. bonds weight	ISK risk-free (REIBID) weight	Icelandic equities weight	MSCI World (ISK) weight	US T-bills (ISK) weight	Gold (ISK) weight	MSCI Emerging Markets (ISK) weight	UK gilts 10y (ISK) weight
5.5%	5.9%	-	45.4%	24.3%	-	30.4%	-	-	-
6.0%	4.1%	-	65.3%	16.6%	-	18.0%	-	-	-
6.5%	2.9%	-	85.3%	9.0%	-	5.7%	-	-	-
7.0%	2.6%	12.2%	80.4%	4.9%	2.5%	-	-	-	-
7.5%	3.0%	22.9%	65.1%	2.9%	9.1%	-	-	-	-
8.0%	3.8%	33.5%	49.8%	0.9%	15.8%	-	-	-	-
8.5%	4.9%	45.9%	31.1%	-	22.9%	-	-	-	-
9.0%	6.2%	60.0%	9.5%	-	30.5%	-	-	-	-
9.5%	7.6%	58.2%	-	-	41.8%	-	-	-	-
10.0%	9.3%	43.8%	-	-	56.2%	-	-	-	-

Source: author's calculations based on Nasdaq Iceland indices, Central Bank of Iceland, Bloomberg (for international assets), and official exchange rates

one-year averages. Foreign safe assets and gold offer valuable protection in the event of an ISK collapse, but their low average excess returns suggest they are better suited to crisis management than strategic allocation. Once global equities are available, the efficient frontier essentially spans just three asset classes: Icelandic government bonds act as the low-risk anchor, while the MSCI World index acts as the growth engine. The ISK risk-free asset is only relevant at low target returns. Portfolios targeting expected returns of 6.5% or less are inefficient because there are higher-return combinations available at the same or lower risk. In short, long-term efficiency for an Icelandic investor requires meaningful global equity exposure, anchored by high-quality domestic bonds rather than a heavy focus on domestic equities.

6. Discussion

The results naturally connect to the broader literature on international portfolio choice and home bias. The strong performance of global equities and the weakness of domestic equities reflect classic findings on the benefits of diversification across borders (Grubel, 1968; Solnik, 1974). The correlation patterns in the data demonstrate the importance of this for a small open economy: domestic shocks tend to be localised, whereas foreign assets, particularly global equities and foreign safe assets, are subject to a much broader range of global forces. The literature on currency risk (e.g., Adler and Dumas, 1983) also helps to explain the results. Exchange-rate movements amplify both gains and losses for investors measuring returns in volatile domestic currencies, and this amplification plays a central role in crisis episodes. Furthermore, the fact that many countries maintain substantial domestic holdings despite these diversification benefits

is consistent with the home-bias puzzle documented by Tesar and Werner (1995) and explored further by Lewis (1999).

Data from Iceland illustrates how these mechanisms manifest in practice. Although domestic equities deliver high arithmetic returns, they fail to compound into meaningful long-term wealth due to extreme downside risk. The 2008 collapse, during which the domestic market fell by 94.4%, widens the gap between arithmetic and geometric returns, explaining why domestic equities appear much more attractive in one-period averages than in long-term outcomes. A loss of 94.4% leaves only 5.6% of the initial value, meaning that breaking even would require a subsequent gain of around 1,600%, i.e., an almost seventeen-fold increase. This is also why the Sharpe ratio, which is based on arithmetic excess returns, can paint a rosier picture of domestic equities than their compounded performance warrants. The crisis year also shows how foreign assets can generate outsized ISK returns during periods of domestic distress, not because of a boom in global markets, but due to a collapse in the exchange rate. This asymmetry influences long-term optimisation, as extreme observations have a lasting impact in mean–variance settings.

The efficient frontier summarises these forces. Even with eight assets available, the optimal long-term portfolio structure is very simple: at the low-risk end are combinations of the risk-free ISK asset and Icelandic government bonds, and at the higher-risk end, global equities are the main growth engine. Once these three instruments are in place, no other asset class meaningfully improves the risk–return trade-off under long-only constraints. Despite providing valuable insurance in crises, foreign safe assets do not deliver sufficient long-run excess returns in ISK to earn a stable place on the frontier. Although gold and emerging

markets occasionally perform well in individual years, they lack the consistency needed to achieve long-term efficiency. Burdened by extreme volatility and poor compounded performance, domestic equities fall out almost immediately once international options are included.

These findings extend beyond the Icelandic case. Many small open economies share structural features that limit the scope for diversification within their domestic portfolios, such as narrow local equity markets, concentrated sectors, exposure to idiosyncratic domestic shocks and currencies that can fluctuate sharply during periods of stress. In such environments, domestic assets often offer poor diversification and unreliable long-term returns. In contrast, global equities offer exposure to a broader range of growth opportunities and risks that are not tied to local conditions. Therefore, the main conclusion is that investors in small open economies need international diversification to achieve stable, long-term growth. Heavy reliance on domestic markets exposes them to concentrated, poorly compensated risks.

The results also highlight the cost of home bias. This is an investor who remains largely domestic. This could be due to regulation, familiarity, or behavioural preferences. Facing a structurally weaker risk–return trade-off than an investor who diversifies abroad. The Icelandic data clearly demonstrate this: a modest allocation to global equities would have significantly enhanced long-term performance and mitigated the likelihood of substantial losses. The lesson for small open economies is straightforward. Remaining domestic is not a neutral choice; it is an

expensive one. In order to preserve and grow wealth in the face of local shocks and currency volatility, global diversification is essential.

7. Conclusions

This study examined the long-term asset allocation of an investor in a small open economy, using data from Iceland between 1992 and 2024. The core message is straightforward. Domestic asset markets are too narrow and volatile to support efficient long-term portfolios on their own. In particular, domestic equities delivered weak compound returns because large losses, most notably the 94% collapse in 2008, offset the gains implied by their high arithmetic averages. International assets, however, change the picture entirely. Global equities offer the strongest and most stable long-term returns in ISK terms. Once included, they dramatically simplify efficient portfolios. Across a broad opportunity set, the efficient frontier is reduced to a simple three-asset mix: This consists of domestic government bonds for stability, the Icelandic risk-free asset for safety and global equities for growth. Other assets either add little to long-term efficiency or only serve episodic, crisis-specific roles.

The implications for investors in small open economies are clear. A heavy domestic focus comes at a cost. Long-term efficiency requires meaningful exposure to global markets. Without this exposure, investors face concentrated risks that offer little compensation, leaving them vulnerable to the types of shocks that have repeatedly shaped Iceland's financial history. Therefore, international diversification is not just an enhancement; it is a necessity. It is a necessity for preserving and growing wealth over time.

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