



4th March 2014

ASR Composite Equity Risk Premium Estimates

Estimating the ERP involves balancing model risk with input risk

In this note we bring together the methodology behind the construction of our ASR Composite Equity Risk Premium (ERP) Estimates. All the major textbook methods of estimating the ERP have issues: the simpler ones have model risk (that the model is not representative of the real world), while the more complex ones have input risk (that the input variables might be incorrect).

Combining models reduces the risk - a simple median is sufficient

One solution to this issue is to harness 'the wisdom of the crowds,' in which the error of a set of estimates is lower than the error of a single one. So we combined 9 models into a composite. We have aggregated using the median, rather than the first component of a PCA analysis since it possibly detects more of the shifts in the underlying ERP, and is less affected by simple price moves.

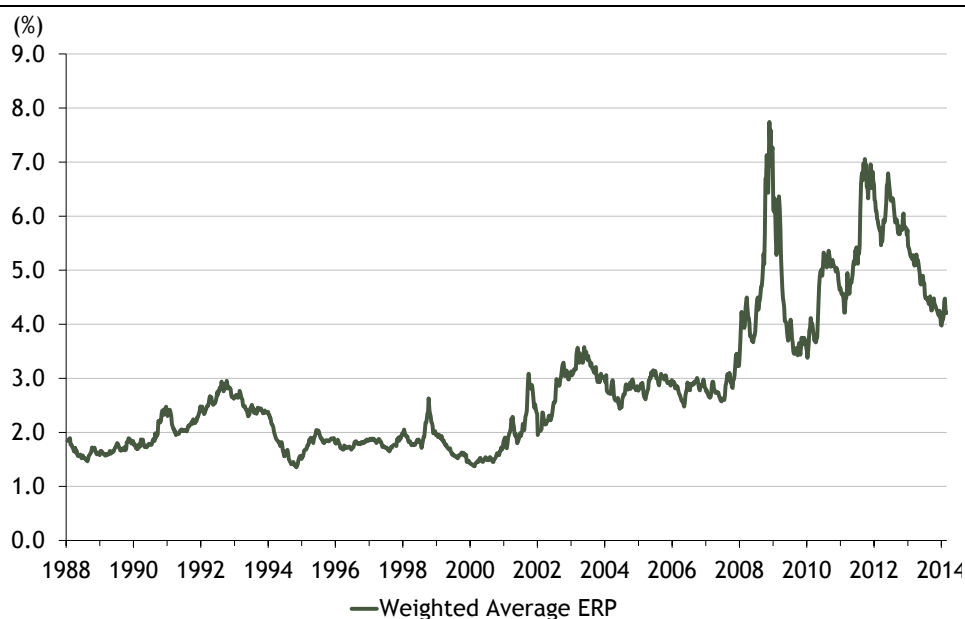
Building aggregate ERPs for Eurozone and global equity markets

We have built composite ERP estimates for 19 countries around the world. While the calculation of the Eurozone ERP as an aggregate of countries or a single entity might appear to be an important conceptual difference, in practice we have found the results of both methods to be similar. We have also created an ASR Global Composite ERP, weighted by equity market size.

In most countries the ERP is still elevated, but falling

Most countries have ERPs that are elevated compared with their 25 year histories, but countries such as the US, UK and the Eurozone have seen significant declines over the last 2 years and so might no longer be unequivocally cheap. These estimates are expected to be available from the end of March on the Datastream platform, using the codes in the Appendix.

Chart 1: Global composite equity risk premium - weighted by equity market size



Source: ASR Ltd.

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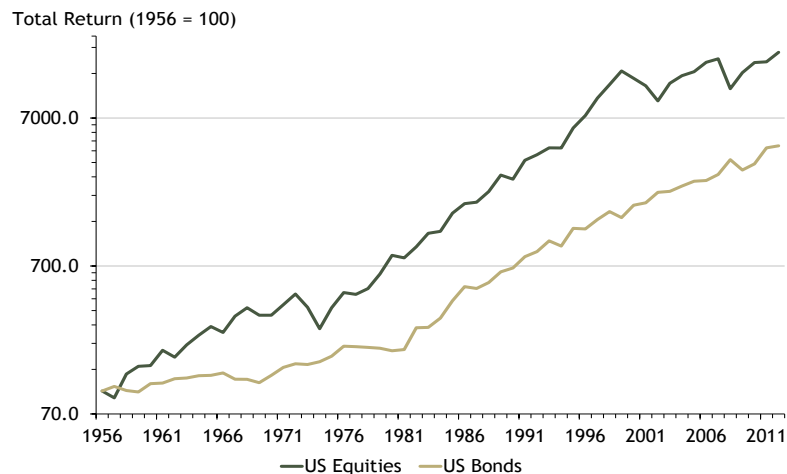
US Equities have returned a premium over bonds...

Estimating the Equity Risk Premium

ERP is the additional return for risk of holding equities

Over the long run, US equities have given investors a higher return than US bonds. As total return data from Dimson, Marsh and Staunton shows in Chart 2, since 1955, US equities have had a total return of 9.9% pa, while US bonds have returned 7.1%, a difference of 2.8% each year.

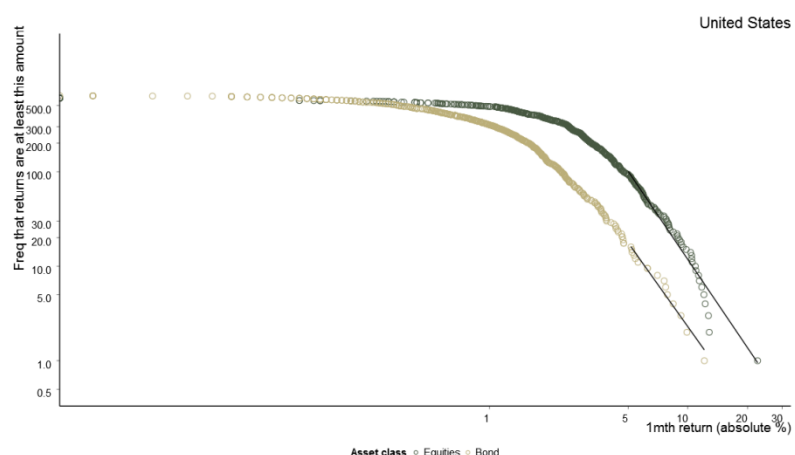
Chart 2: US equities have returned 2.8% pa more than US bonds



Source: ASR Ltd. / Dimson, Marsh & Staunton

Of course there is a reason for this. Holding equities in a portfolio is more hair-raising, since their price fluctuates more. In Chart 3, we have plotted in a Zipf chart, the log of monthly returns against the log of their frequency of occurrence. The higher risk of equities is clearly shown by the points for the equity market (in green) lying to the right of those of the bond market (in gold).

Chart 3: ...but this premium is to compensate for the higher risk



Source: ASR Ltd. / Thomson Reuters Datastream

Since the art of portfolio construction is based around balancing risk and return, understanding and placing a value on the ERP is a vital step in building a multi-asset portfolio.



The term Equity Risk Premium covers 4 different concepts

Four different concepts termed the Equity Risk Premium

The first issue in determining the value of the ERP is to define it. As Prof Fernandez argues, the term Equity Risk Premium covers at least four different concepts:

- Historical ERP – *What equities, in the past, have returned in excess of bills or bonds.*
- Required ERP – *The additional return over bonds that investors require in order to make further equity investments. Often found by surveys of investors and management.*
- Expected ERP – *What excess return equities are expected to provide over bonds. This is a forecast of equity returns, and so might rise during bubble periods.*
- Implied ERP – *The excess return over bonds implied by the current market price. Has to be estimated using models with assumptions about growth etc.*

Historical ERP is easy to calculate if you have the data...

The first concept, Historical ERP, is relatively easy to calculate, although the answer does somewhat depend on the time period used and whether geometrical or arithmetic averages are used. This is the ERP that is most often quoted usually from sources such as Ibbotson or Dimson, Marsh and Saunders. However, using the historic ERP in portfolio construction implies that the future is going to be like the past.

...but future returns can be different to the past

Expected returns can be found using surveys, but this raises the question of how survey respondents decide on their answers in the first place. We believe their responses will be anchored to either historic returns or based on some kind of model of expected return.

Expected returns can be found via surveys or by models...

So using models to derive the Implied ERP instead may be more rigorous and transparent. But this leads us to the second issue about finding the ERP: there are many possible rival models to choose from.

...which compute the implied return.

As we have written before, some of these models rely on assumptions or estimates that may no longer be valid. For instance in the current period of corporate cash hoarding, the distribution and ROE assumptions of the simple Gordon's Growth Model are breached. Also, if earnings are unusually depressed or boosted then simple ERP models may give erroneous results.

Major types of models are based on valuing cashflows.

To limit these problems we have adopted the same approach as Rosa & Fernando of the NY Fed and created a composite ERP based on 9 commonly used models. These are listed in Table 1. Our models can be grouped into three categories:

Dividend discount models. These models essentially value the dividends (and also share buybacks) paid to shareholders, in order to calculate a discount rate, which then is used to determine the equity risk premium.

Earnings driven models base the valuation on earnings rather than dividends and so compensate for low or no distribution



Cross-sectional and timeseries regression models are used academically...

...but less so among practitioners.

stocks. To adjust for different stages of the economic cycle, we have also used two estimates of trend earnings.

Residual Income Models are the final category in our ERP composite. They take into account the ability of companies to earn more than needed for reinvesting and growing the business. This surplus earnings, or 'Residual Income' is valued and used to calculate an implied discount rate.

Other models and techniques are possible, such as cross-sectional regression and default risk, but we have not yet included them in our composite as we doubt they are widely used by practitioners, and the variance of their results is extremely wide.

Table 1: Methods for calculating the ERP

Model	Description	Formula	Comments
Dividend Discount models			
Gordon Growth	ERP is the dividend yield	d_1/p	Should adjust d_1 for share buybacks
Damodaran DY	DY adjusted for analyst earnings forecasts	$P_t = \sum_{k=1}^5 \frac{D_t(1+g_t)^k}{\rho_t^k} + \frac{D_{t+6}(1+g_t)^6}{(\rho_t - R_t^f)\rho_t^5}$	Damodaran method. Assumes constant payout ratio
Modified Damodaran	DY adjusted for analyst dividend forecasts	As above	Similar to above but not reliant on payout ratio assumption
Earnings driven			
Yield gap 'Fed Model'	Earnings yield less risk free rate	$(e_1/p) - r_f$	Debatable if r_f should be nominal or real.
Trend earnings yield gap	Similar to above but based on trend earnings and using real bond yields	$(e_t/p) - rr_f$	Trend earnings based on history since 1973. Assumes constant trend growth.
10yr trend earnings yield gap	Similar to above but based on 10 year trend earnings and using real bond yields	$(e_{10t}/p) - rr_f$	Relaxes the assumption that trend growth is constant.
Residual Income Models			
Residual income	Takes into account the need to retain earnings for growth	$ERP = \frac{ROE - r_f}{ROE \times PE}$	Assumes constant returns and growth rates.
1-stage DCF	Discount rate in Gordon Growth Model less risk free rate	$P = \frac{E_1(1 - g/ROE)}{(r_e - g)}$	ASR model uses ROE-COE of 3%
3 stage DCF	Discount rate in 3 stage DCF less risk free rate	$P = \frac{E_1(1 - g/ROE)}{(1 + r_e)} + \sum_{n=2}^5 \frac{E_n(1 - g/ROE)}{(1 + r_e)^n} + \frac{E_6 \times (1 - g/ROE)}{(r_e - g)(1 + r_e)^5}$	ASR model using IBES estimates. ROE-COE is 3%.

Note: see appendix for full explanation of these models

Source: ASR Ltd



Combining multiple models...

...should reduce model risk and...

...input variable risk.

Choice of aggregation methods

But the mean is at risk from outliers.

Taking the first component of PCA is a well established statistical technique...

...but has issues if the number of models changes...

Combining estimates to reduce model risk

The advantage of using a composite to estimate the ERP is that if the models are independent, then it should reduce the error in our estimate. Just like Galton discovering the average of guesses for the weight of an ox was more accurate than individual guesses, so if our models are not biased, then an aggregate should be more accurate.

There are three methods of combining estimates that we have considered:

- Mean
- First component of a Principal Component Analysis (PCA).
- Simple Median

We avoided the mean, since we feared it could be unduly affected by outliers.

The PCA technique tries to extract the key underlying factor (the ERP) from the timeseries. Our PCA analysis showed that the first component comprised about 85% of the variance (Chart 4).

Chart 4: 1st Component picks up around 85% of total variance

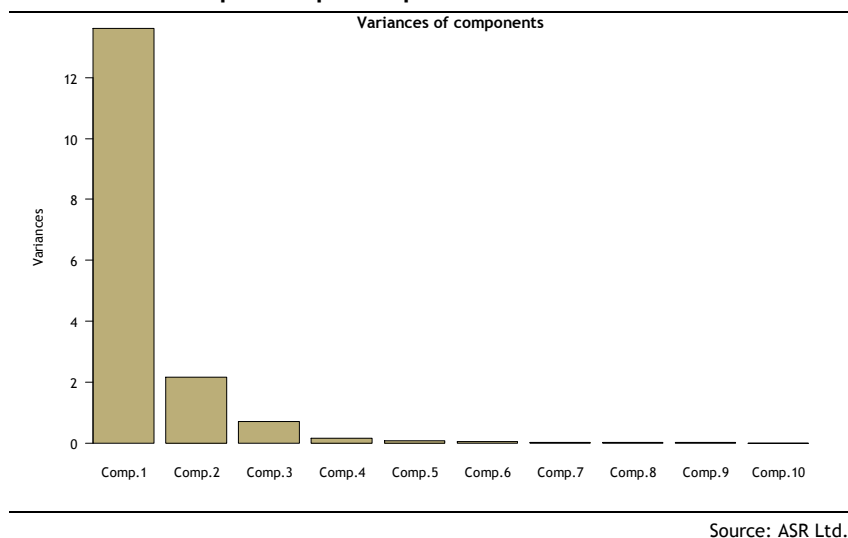
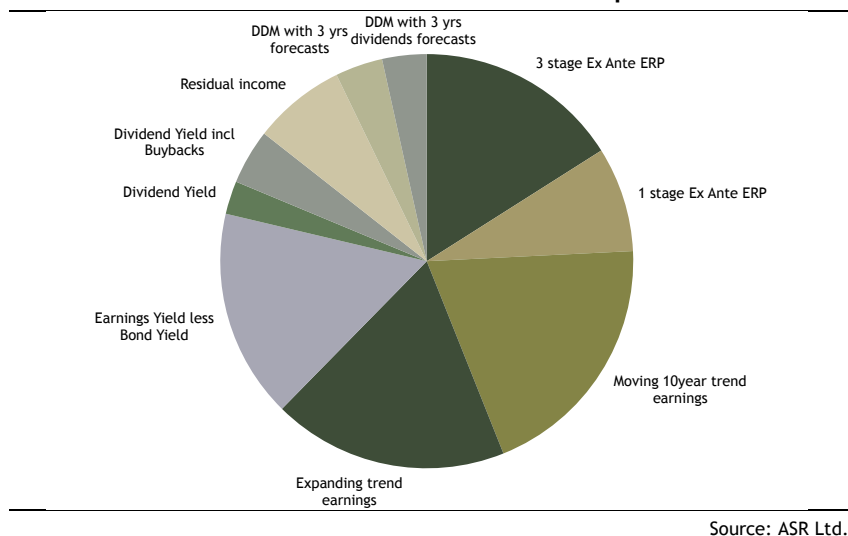


Chart 5: Contribution of each model to first component of PCA



The models that gave the largest contribution (Chart 5) were:



...and it is not clear that the first component is the ERP...

- Fed Model based on Expanding trend earnings,
- Fed Model based on Moving trend earnings
- Fed Model based on current yields
- 3-stage DCF

The problem with the PCA measure, in our view is that this is might actually be picking up another underlying factor: the relative performance of bonds and equities. It has an 85% correlation, whereas the median has 73% correlation (Table 2).

In our view this suggests that the Median is extracting more of the changes to expectations and risk appetite in the ERP, than the PCA.

...and it has a very strong relationship with the relative performance of equities and bonds.

Table 2: Comparison of PCA and Median techniques

Correlations	3mth changes		12mth changes	
	PCA	Median	PCA	Median
PCA 1st Component		0.86		0.86
Median	0.86		0.86	
Equity Market	-0.68	-0.61	-0.66	-0.51
Equity / Bonds	-0.85	-0.73	-0.82	-0.64
BY/EY	-0.77	-0.62	-0.75	-0.59

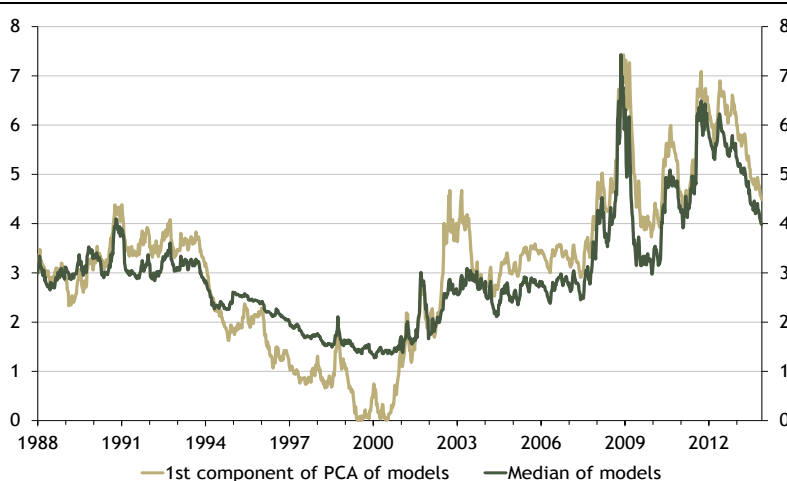
Source: ASR Ltd

So we have opted to aggregate using the median.

A comparison of the two measures shows that over the last 10 years, there has been little difference between them (Chart 6). The key differences occur between 1996 and 2004, a period of 'irrational exuberance', especially at the peak of the bubble in 2000, when the PCA measure implied a zero or even negative ERP. In our view the exuberance related to excessive expectations of earnings growth, rather than extremely low risk appetite – outside of TMT, stock valuations were not excessively high. So in our view the Median is a fairer representation of the period and so we have used it to calculate the ASR Composite ERP. We also decided to keep our methodology simple by not weighting the different models.

In recent years they have given similar results...

Chart 6: Comparison of PCA and Median estimates of ERP



Source: ASR Ltd.

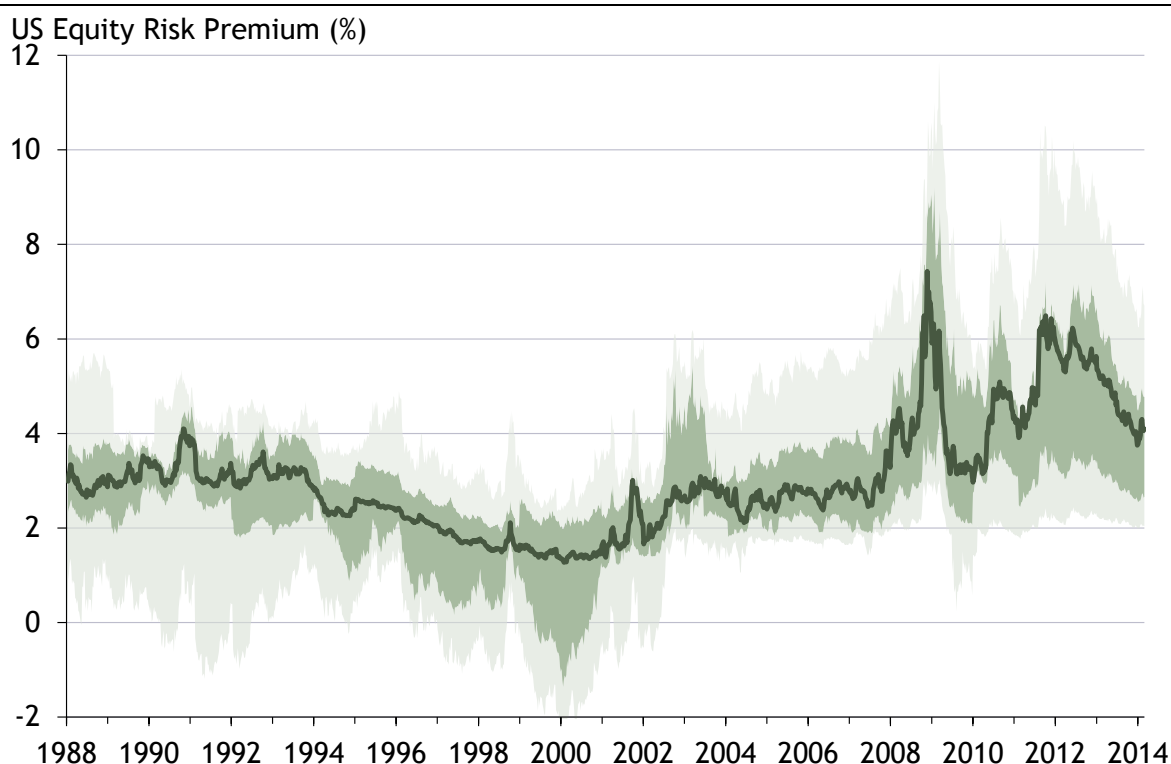
...but diverged strongly from 1996 to 2004



The ASR Composite ERP for major markets

Now that we have described the methodology, on the following pages we present the ASR Composite ERP estimates.

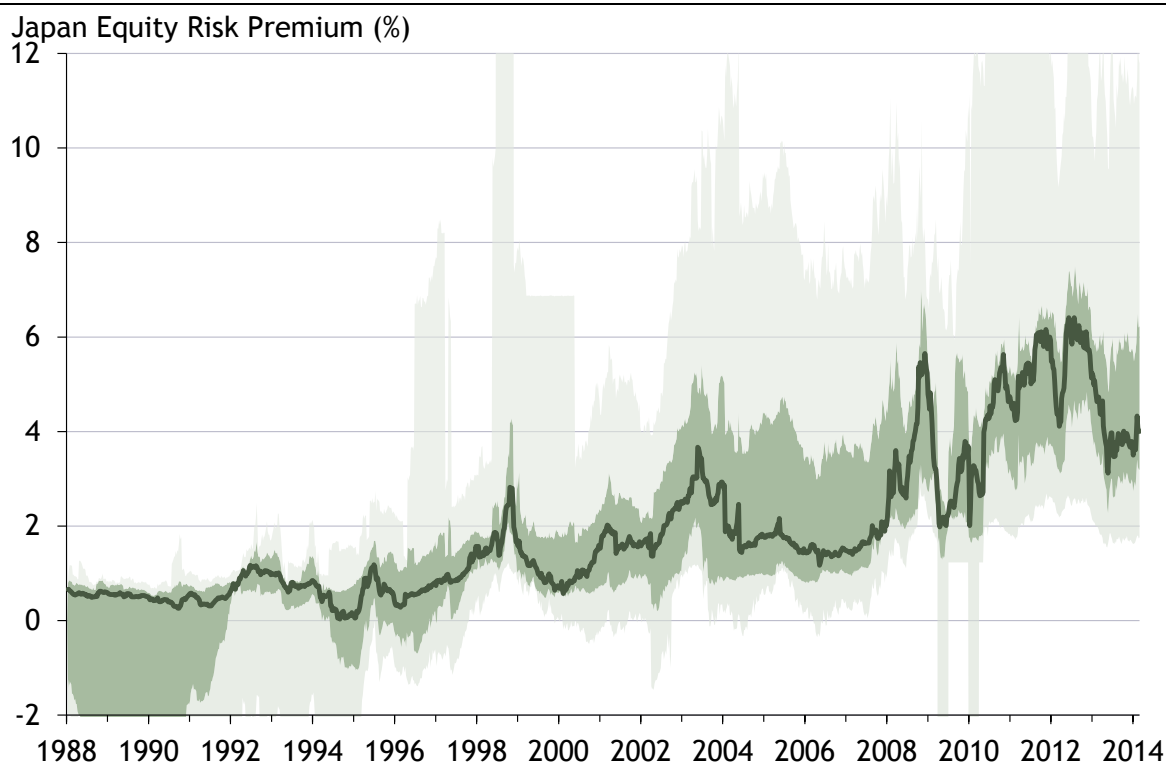
Chart 7: Estimate of implied equity risk premium - United States



Note: shading indicates Min, Max and inter-quartile ranges

Source: ASR Ltd.

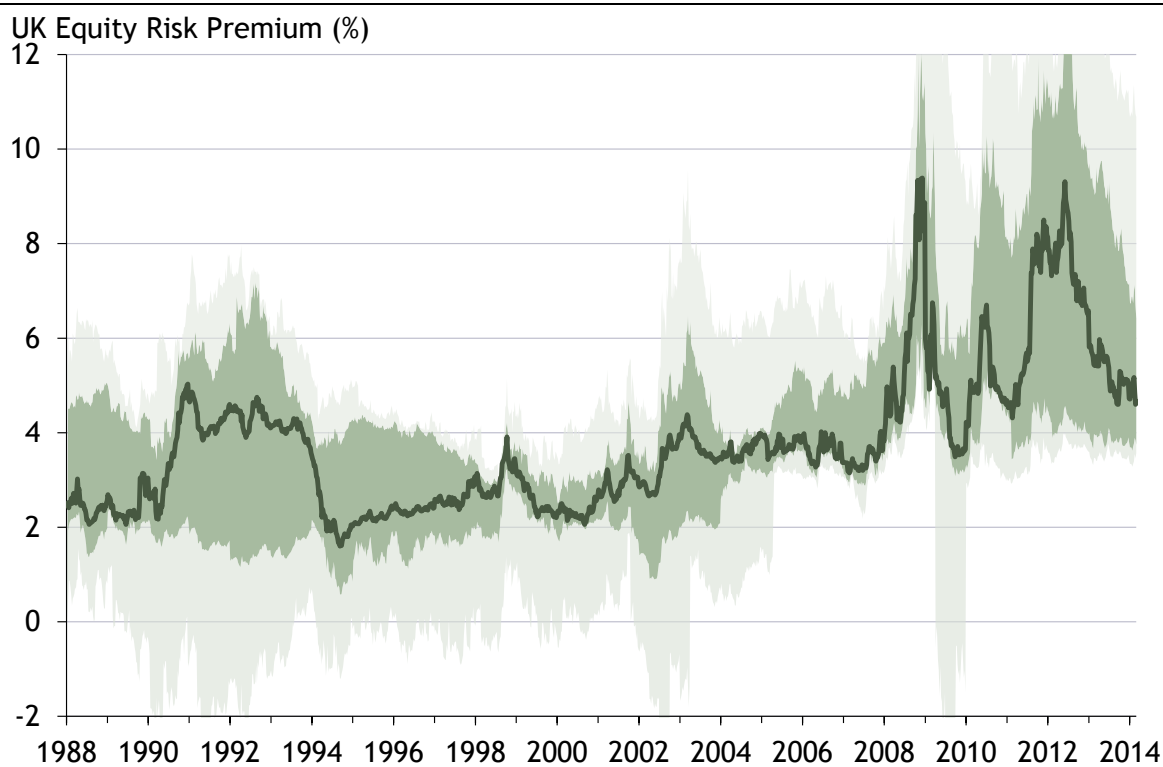
Chart 8: Estimate of implied equity risk premium - Japan



Note: shading indicates Min, Max and inter-quartile ranges

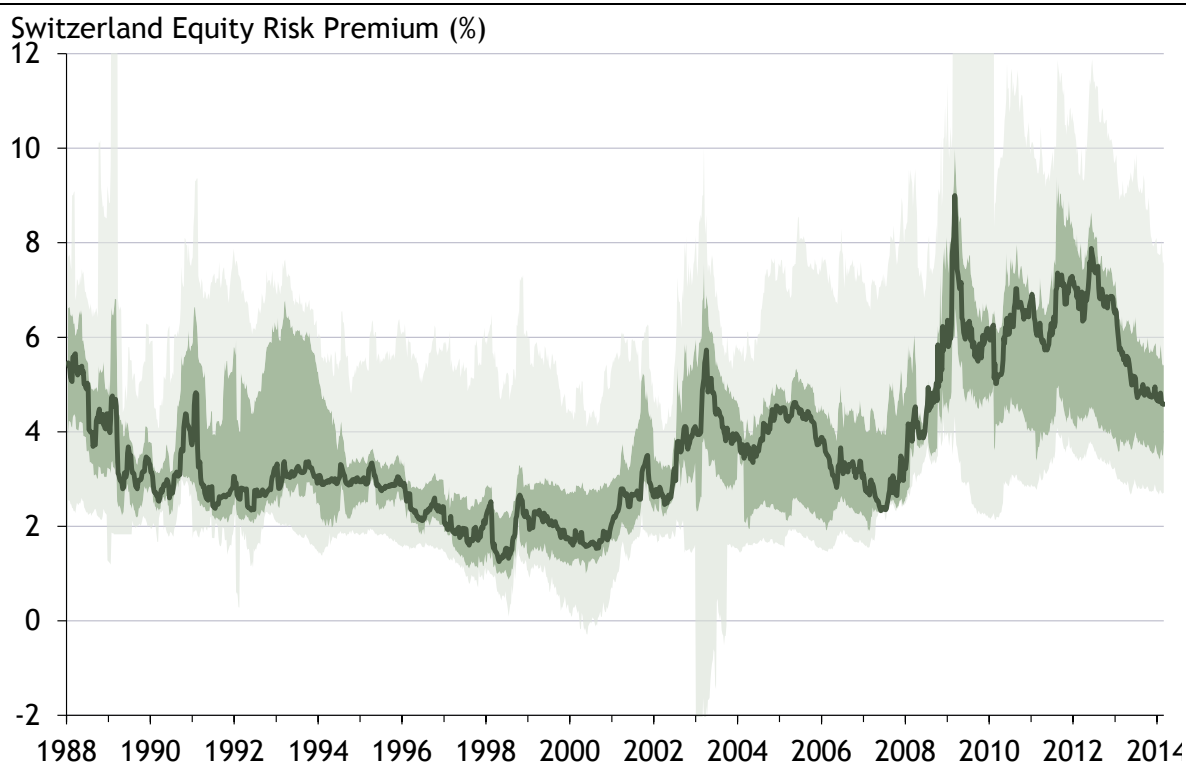
Source: ASR Ltd.



Chart 9: Estimate of implied equity risk premium - United Kingdom

Note: shading indicates Min, Max and inter-quartile ranges

Source: ASR Ltd.

Chart 10: Estimate of implied equity risk premium - Switzerland

Note: shading indicates Min, Max and inter-quartile ranges

Source: ASR Ltd.



European countries - ASR Composite ERP

We have also calculated estimates for the major Eurozone countries and Sweden. They represent about 86% of the total market cap.

Chart 11: Germany

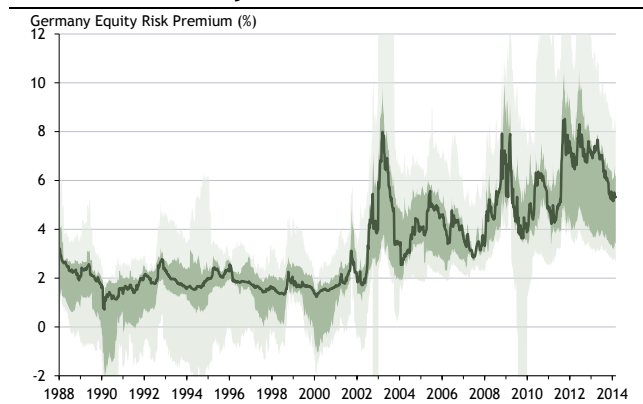


Chart 12: France

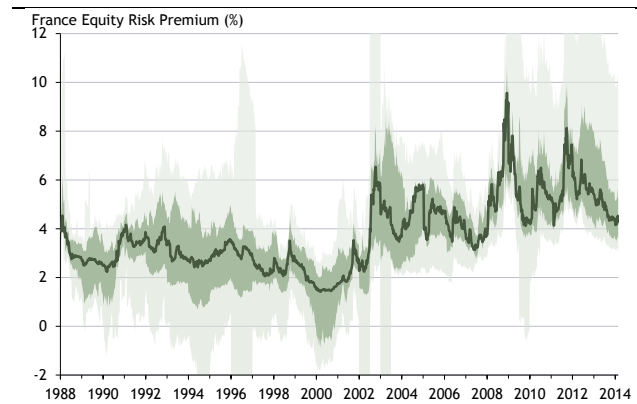


Chart 13: Netherlands

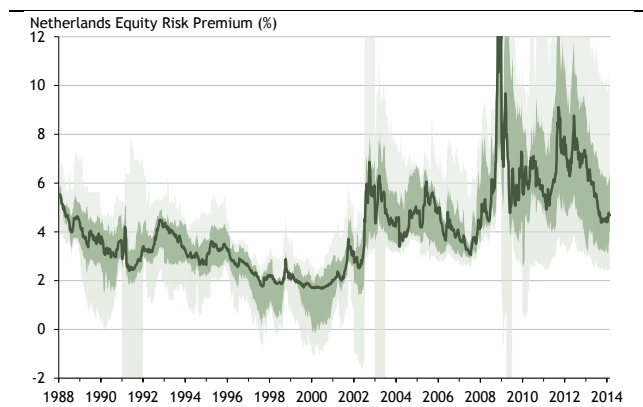


Chart 14: Italy

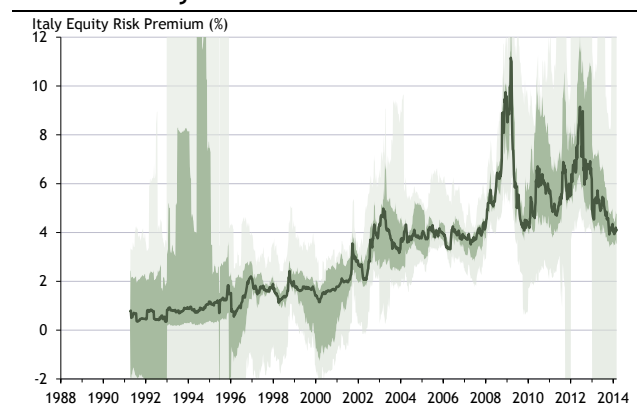


Chart 15: Spain

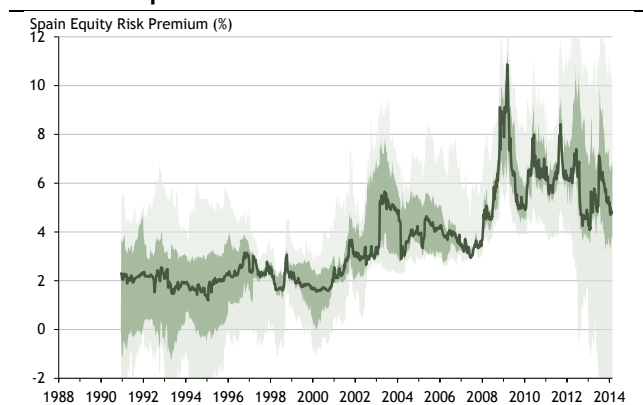
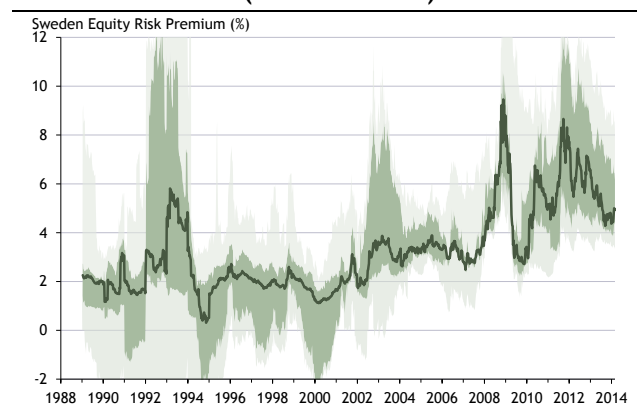


Chart 16: Sweden (non-Eurozone)



Note: shading indicates Min, Max and inter-quartile ranges

Source: ASR Ltd.

Surprisingly Germany has a higher ERP than other Eurozone countries

So Germany AG is not getting the benefit of low bund yields.

Maybe the greatest surprise is that Germany has had a higher ERP during the Eurozone crisis than much of the rest of the Eurozone. As the Eurozone crisis has eased and the Eurozone ERP has fallen, then the German ERPs have not also come down. So Germany now has one of the higher ERPs across the Eurozone and low Bund yields are not benefitting German corporations.



Two possible reasons are that German corporations are 'bigger than Germany' and so exposures to the rest of the Eurozone and to emerging markets are important. Also German investors who are fleeing Bunds due to their low yields, might not be limiting themselves to German equities.

Can consider the Eurozone market to be either...

...a single entity...

...or a collection of markets.

For the former approach, there is the question of what is the risk free rate.

But in the end the answers are similar.

Calculating a Eurozone Equity Risk Premium

We can estimate the Eurozone ERP using two approaches: the first is to treat the Eurozone as a single entity, or as a collection of national equity markets.

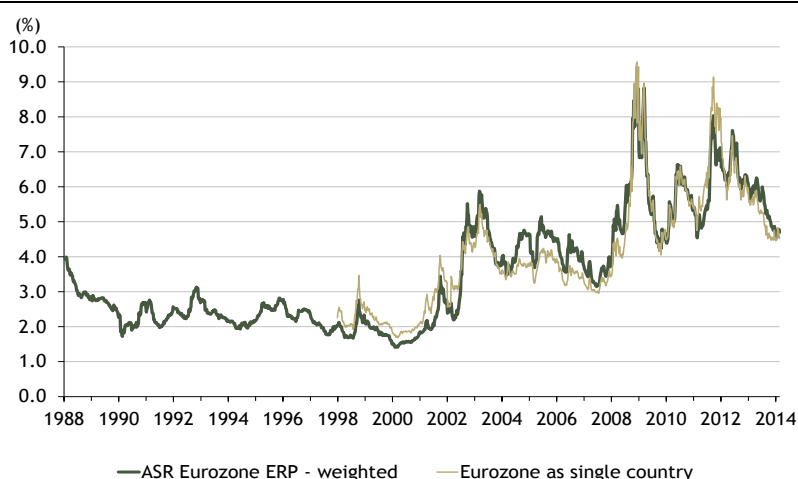
For the first approach, finding aggregates of equity prices, yields, dividends and earnings is straight forward. But as the ERP is the difference between the expected return on equities and expected risk free rate, there is an issue. In the Eurozone there is no central government, so what is the risk free rate? While the ultimate risk free euro asset is a deposit at the ECB, it is short term, and so no help in our calculations.

We could take a weighted average of all the national bond yields but this would introduce a credit/ illiquidity/ redenomination risk into our 'risk free' rate. So if we want to consider the Eurozone as one entity then, in our view, we should use the lowest bond yields in the Eurozone (such as a 50:50 combination of Germany and France).

The second approach is to continue to treat each local national stock market as separate with its local government bond yield providing the risk free rate, and then to aggregate each country's ERP together.

We have compared the two approaches in Chart 17 which shows that there has been little difference between the two estimates. In fact during the Eurozone crisis, the difference was less than prior to the credit crunch.

Chart 17: Eurozone ERP as a single entity and as aggregate



Source: ASR Ltd.



Difficult to create historic estimates of ERP in emerging markets...

...due to political and other events.

As implied ERPs are based on current market variables...

...it is possible to estimate the ERP for emerging markets.

ASR Composite ERP for Emerging Markets

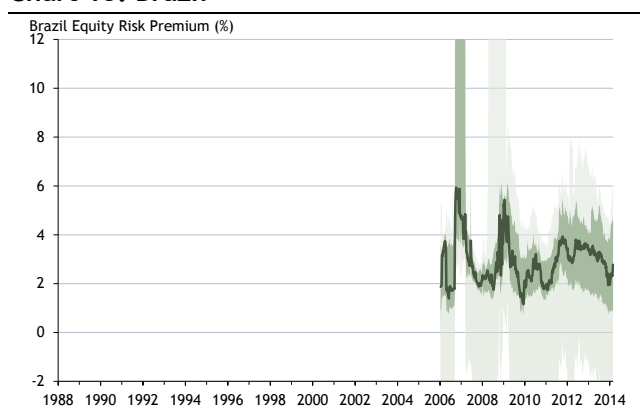
Estimating the current ERP using past returns requires a long history of share prices. While Dimson, Marsh and Staunton have done extensive analysis creating total return histories, they have only been able to complete their work for 16 countries. In the footnote for the German series they reveal one of the issues. They were unable to bridge the total loss suffered during the hyperinflation of Weimar Republic. Other emerging market countries have similar issues and losses, which make their historic indices of returns irrelevant for estimating future returns.

Models of implied ERP are less exposed to these issues, since they are mainly based on current valuations and forecasts. So we have created ERP's for emerging markets including Brazil, Russia, India and China.

Our work shows that the ERP has evolved differently in each country. Since 2010, India's ERP has been largely stable at about 2.4%, but China has been on a rising trend and currently stands at 5.8%. This rise has been matched by the increase in the Hong Kong ERP.

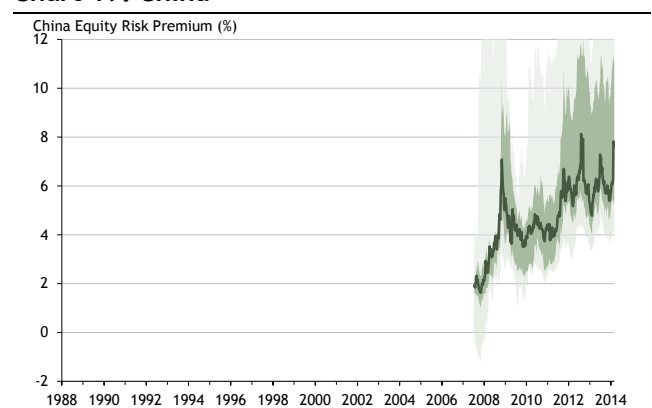
Mexico is an example of where we only have a short history of the local currency ERP, but how that has not stopped the estimation of its ERP. With relatively good growth and fiscal dynamics, the ERP is at the low end of the range of countries and currently stands at 2.5%.

Chart 18: Brazil



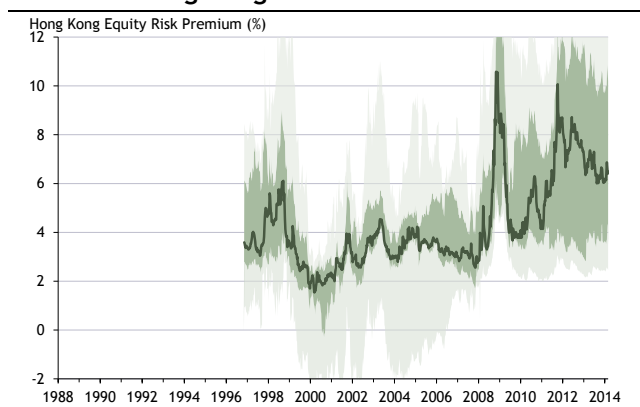
Source: ASR Ltd.

Chart 19: China



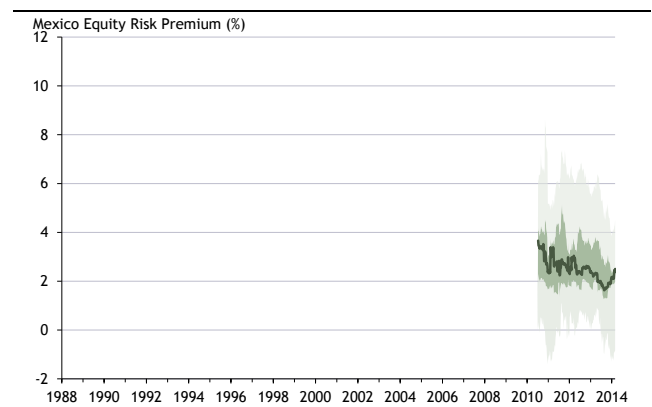
Source: ASR Ltd.

Chart 20: Hong Kong



Source: ASR Ltd.

Chart 21: Mexico



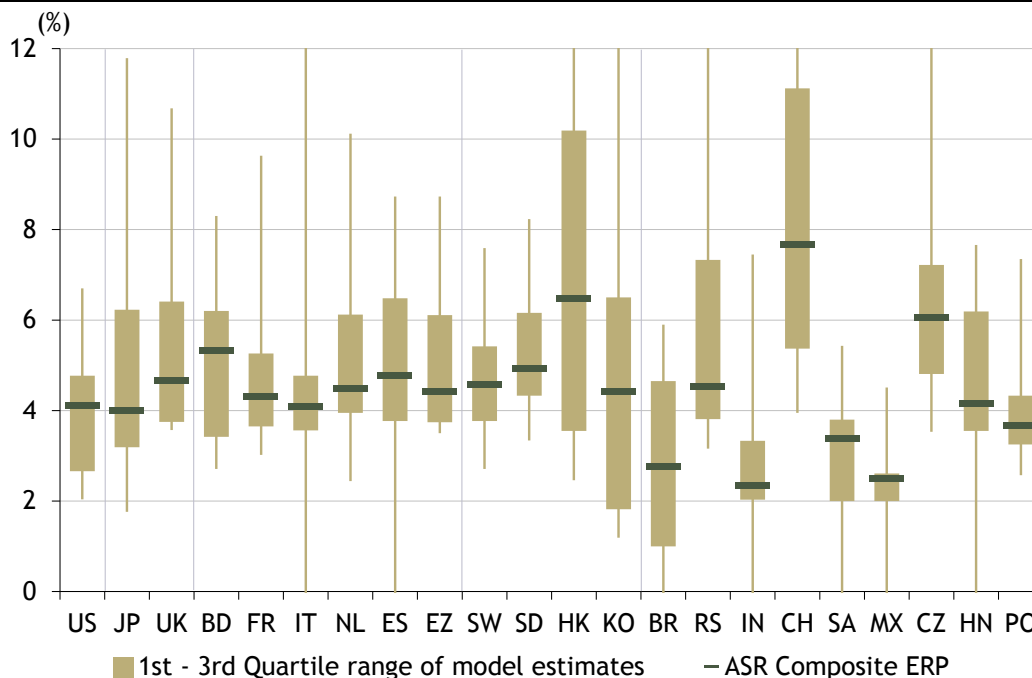
Source: ASR Ltd.



Global Comparison of ASR Composite ERP estimates

With a consistent methodology and data sources, it is possible to compare the ERP for equity markets around the globe, along with the range of model estimates (Chart 22). Developed markets, mainly on the left, tend to have a tighter spread of estimates.

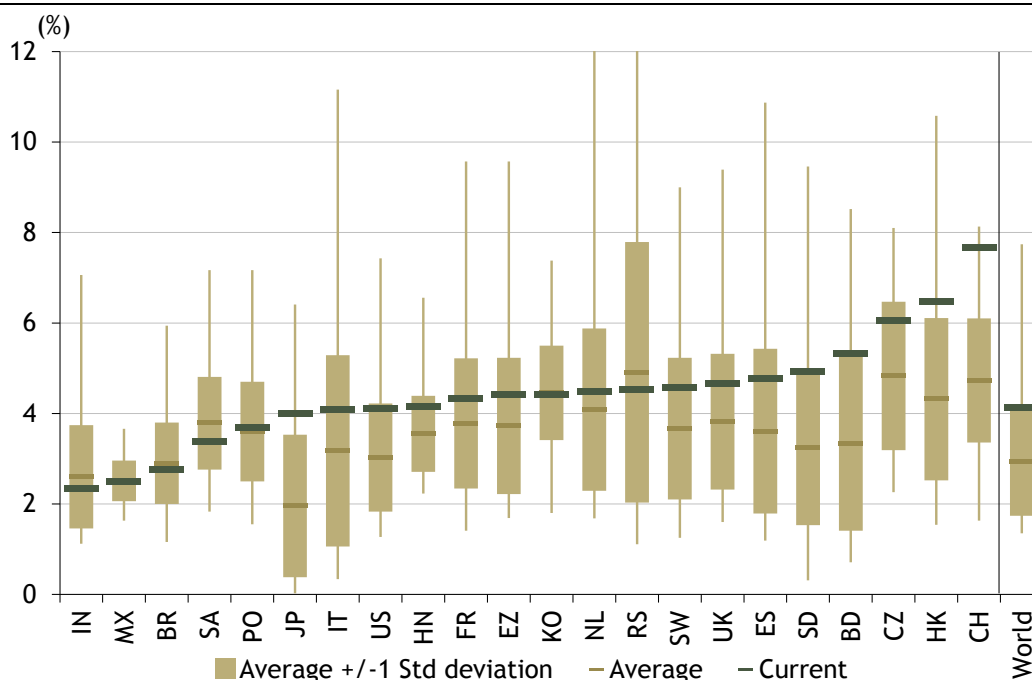
Chart 22: Current ASR Composite ERP and range of model estimates by country, February 2014



Source: ASR Ltd.

But it is in the emerging markets of Mexico, India and Brazil that have the lowest current estimates of the ERP.

Chart 23: Current ASR Composite ERPs against historic ranges



Source: ASR Ltd.



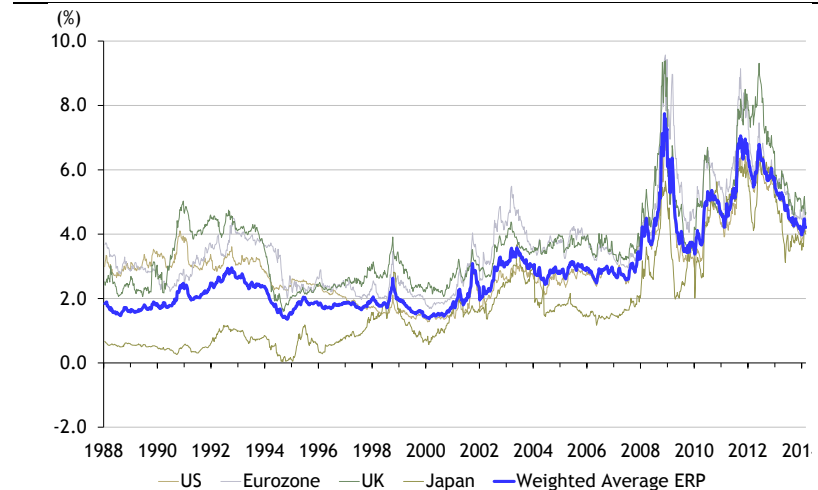
Creating an estimate of the Global Equity Risk Premium

With these national and regional ERP estimates, we have created an average Global Composite ERP weighted using the equity market capitalisations.

At its peak, the credit crisis drove the global ERP up to 8% (Chart 24). But this measure also shows that the Eurozone crisis was just as significant, with the ERP peaking in 2011 at 6.9%. At 4.2%, the global ERP remains elevated at one standard deviation above average.

Chart 24: Global Equity Risk Premium - Weighted by Equity Market

We have aggregated national ERPs using the mean weighted by market capitalisation.



Source: ASR Ltd. / Thomson Reuters Datastream

Conclusion

While the expected Equity Risk Premium is a key component of portfolio construction, it is not directly observable. However, ASR has created a set of Composite ERPs that calculate the ERP implied by market prices in a way that reduces the risk from the choice of model and from the input variables.



Appendix - ASR Composite ERP Datastream codes

Our ASR Composite ERP estimates are expected to be available from the end of March on the Datastream platform.

Table 3: List of Datastream Codes

Country/Region	Code	Start Date
Global	WDASERP	Jan-88
United States	USASERP	Jan-88
Japan	JPASERP	Jan-88
Western Europe	EEASERP	Jan-88
Eurozone	EKASERP	Jan-98
Germany	BDASERP	Jan-88
France	FRASERP	Jan-88
Netherlands	NLASERP	Jan-88
Italy	ITASERP	Apr-91
Spain	ESASERP	Dec-90
United Kingdom	UKASERP	Jan-88
Switzerland	SWASERP	Jan-88
Sweden	SDASERP	Jan-92
China	CHASERP	Jul-07
Czech Republic	CZASERP	Nov-03
Hungary	HNASERP	Jul-01
Mexico	MXASERP	Jul-10
South Africa	SAASERP	Sep-00
Brazil	BRASERP	Jan-06
India	INASERP	Jan-00
Poland	POASERP	Jan-04
Russia	RSASERP	Jan-04

Source: ASR Ltd, Thomson Reuters Datastream



Appendix: List of datasources

Table 4: List of data sources used in ASR Composite ERP

	Equity price	Bond Yields	ROE	Trailing PE	Consensus earnings & dividend forecasts	Trend Earnings	Inflation index
United States	Datastream	Datastream Benchmark 10 yr US	Datastream Worldscope	Datastream	FTSE World US - IBES	Datastream	CPI All Urban sample
Japan	Datastream	DS Bchmk 10 yr Japan	Datastream Worldscope	Datastream	FTSE World Japan - IBES	Datastream	CPI Tokyo, all items
UK	Datastream	DS Bchmk 10 yr UK	Datastream Worldscope	Datastream	FTSE World UK - IBES	Datastream	UK RPI
Germany	Datastream	DS Bchmk 10 yr Germany	Datastream Worldscope	Datastream	FTSE World Germany - IBES	Datastream	CPI
France	Datastream	DS Bchmk 10 yr France. Before 1986, OECD Long bond yield	Datastream Worldscope	Datastream	FTSE World France - IBES	Datastream	CPI (sourced from OECD)
Italy	Datastream	DS Bchmk 10 yr Italy	Datastream Worldscope	Datastream	FTSE World Italy - IBES	Datastream	CPI
Netherlands	Datastream	DS Bchmk 10 yr Netherlands	Datastream Worldscope	Datastream	FTSE World Netherlands - IBES	Datastream	CPI
Spain	Datastream	DS Bchmk 10 yr Spain	Datastream Worldscope	Datastream	FTSE World Spain - IBES	Datastream	CPI
Eurozone	Datastream	DS Bchmk 10 yr Germany 50% / France	Datastream Worldscope	Datastream	FTSE World Europe ex UK - IBES	Datastream	Eurozone HICP
Sweden	Datastream	DS Bchmk 10 yr Sweden	Datastream Worldscope	Datastream	FTSE World Sweden - IBES	Datastream	CPI
Switzerland	Datastream	DS Bchmk 10 yr Switzerland	Datastream Worldscope	Datastream	FTSE World Switzerland - IBES	Datastream	CPI
Western Europe	Datastream	DS Bchmk 10 yr Germany 75% / UK 25%	Datastream Worldscope	Datastream	FTSE World Europe - IBES	Datastream	German CPI
China	Datastream	DS Bchmk 10 yr China	Datastream Worldscope - based on China A stocks	Datastream (China A)	IBES China Index - IBES	Datastream (China A)	CPI composite of urban and rural residents
Brazil	Datastream	Thomson Reuters Brazil Gov Bchmk 10 Yrs	Datastream Worldscope	Datastream	IBES Brazil Index - IBES	Datastream	IPCA (Broad National CPI)
Russia	Datastream	Thomson Reuters Russia Gov Bchmk 10 Yrs	Datastream Worldscope	Datastream	IBES Russia Index - IBES	Datastream	CPI
India	Datastream	Thomson Reuters India Gov Bchmk 10 Yrs	Datastream Worldscope	Datastream	IBES India Index - IBES	Datastream	All India (General) CPI for Industrial workers
South Africa	Datastream	DS Bchmk 10 yr South Africa	Datastream Worldscope	Datastream	IBES South Africa Index - IBES	Datastream	Consumer Prices, Urban Areas
Mexico	Datastream	DS Bchmk 10 yr Mexico	Datastream Worldscope	Datastream	IBES Mexico Index - IBES	Datastream	National Consumer Price Index
Poland	Datastream	DS Bchmk 10 yr Poland	Datastream Worldscope	Datastream	IBES Poland Index - IBES	Datastream	CPI
Czech Republic	Datastream	DS Bchmk 10 yr Czech Republic	Datastream Worldscope	Datastream	IBES Czech Republic Index - IBES	Datastream	CPI
Hungary	Datastream	DS Bchmk 10 yr Hungary	Datastream Worldscope	Datastream	IBES Hungary Index - IBES	Datastream	CPI
Hong Kong	Datastream	Thomson Reuters Hong Kong Gov Bchmk 10Y	Datastream Worldscope	Datastream	IBES Hong Kong Index - IBES	Datastream	CPI
South Korea	Datastream	Thomson Reuters South Korea Gov Bchmk 10Y	Datastream Worldscope	Datastream	IBES South Korea Index - IBES	Datastream	CPI

Source: ASR Ltd, Thomson Reuters Datastream



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