DUFF & PHELPS

Client Alert

September 14, 2016

Brexit: The Impact on Cost of Capital

Contents

Section 01

Executive Summary

Executive Summary

On June 23, 2016, the United Kingdom held a referendum to decide whether to leave or remain as member of the European Union (EU). Against prior poll prediction, 51.9% of U.K. voters were in favor of leaving the EU, while 48.1% voted to remain a member. This decision is popularly known in the financial press as “Brexit”.

The immediate aftermath of the Brexit vote was a predictable "flight to safety," a similar reaction to that observed after other well-reported geopolitical events that occurred since the 2008 global financial crisis. These “flights to quality” are typically characterized by an increased demand for gold, as well as safe-haven government bonds and investment-grade corporate bonds (with a corresponding decline in yields), while equity markets decline, volatility spikes, and default spreads for speculative-grade (a.k.a. high yield or “junk”) bonds widen.

The increased uncertainty created by the Brexit vote, led valuation and finance professionals to question whether cost of capital inputs should be adjusted to reflect current market conditions when valuing a business or a security.

To assist in this discussion, on July 12, 2016, Duff & Phelps held the second of its Brexit webinar series entitled “The Impact on Cost of Capital,” featuring a panel of world-renowned cost of capital experts. The webcast focused on the challenges of estimating the cost of capital from the perspectives of U.S., U.K., and Eurozone investors in a post-Brexit world.[1]

Speakers included:

- Aswath Damodaran, Professor of Finance, New York University Stern School of Business
- Elroy Dimson, Professor of Finance, Judge Business School, University of Cambridge
- Pablo Fernández, Professor of Financial Management at IESE Business School, University of Navarra
- Roger J. Grabowski, Managing Director, Duff & Phelps
- Yann Magnan, European Valuations Leader, Duff & Phelps.

This article is a follow-up to the issues discussed during the webcast and provides updates to some of the data presented therein. The bulk of this article was based on data gathered through July 25, 2016. However, the last section, entitled “Subsequent Events,” also discusses some recent economic and financial market developments that are pertinent to the debate.

[1] For a replay of the webinar, visit http://www.duffandphelps.com/insights/webcasts-and-videos/brexit-webcast-2-the-impact-on-cost-of-capital.

The aftermath of the **Brexit** vote highlighted challenges faced when estimating cost of capital inputs in the current environment

While the most recent financial market data has not been portrayed in the various exhibits shown in this article, the conclusions remain the same: the aftermath of the Brexit vote highlighted challenges faced when estimating cost of capital inputs in the current environment.

The value of any investment is a function of three key inputs: (i) existing cash flows associated with the investment, (ii) expected growth in the projected cash flows, and (iii) the required rate of return (or discount rate) to convert the expected cash flows into their present value.

This article discusses adjustments that may be considered to both expected cash flows and their growth post-Brexit, as well as to discount rates.

In order to incorporate the incremental risk of Brexit in valuations, adjusting cash flow projections would be a preferable approach to the alternative of adding ad-hoc risk premiums (i.e. alphas) to discount rates. The increased uncertainty of potential outcomes may best be captured through the use of a scenario-based analysis, which would entail estimating (i) the cash flows expected under each scenario; and (ii) a probability factor associated with each of the scenarios.

When dealing with discount rates, there are two basic approaches a valuation professional can take when trying to adjust cost of capital estimates in the current environment, which is distorted by the impact of actions by central banks and investors' flights to quality:

- Estimate a normalized risk-free rate, which is used in conjunction with a forward-looking equity risk premium (ERP) estimated relative to that normalized risk-free rate; or
- Use the current spot yield on debt securities issued by a government considered to be safe (i.e., risk-free) as the risk-free rate, but increase the ERP to reflect a higher (systematic) risk relative to the ultra-low yields.

It is critical to match the second building block, the estimated ERP, to the selected risk-free rate. There must be internal consistency between these two inputs. If the valuation analyst chooses to use the spot yield to estimate the cost of capital during periods when those yields are less than "normal," the valuation analyst must use an estimated ERP that is matched to (or implied by) those below-normal yields.

However, we note that the most commonly used data sources for ERP estimates are long-term series measured when interest rates were largely not subject to such market intervention. Using those data series with an abnormally low spot yield creates a mismatch. In summary, a mechanical application of the data may result in nonsensical results.

Section 02

Background: Post-Brexit Environment

Background: Post-Brexit Environment

Immediately following the June 23, 2016 vote by the U.K. electorate to leave the European Union (EU), shockwaves were sent to global financial markets. The initial state of panic was ensued in the weeks that followed by a recovery in several market indicators.

Yet, the aftermath of the Brexit vote is still characterized by significant signs of uncertainty, which is weighing on investors. Just over a month after the vote:

- The pound Sterling (GBP) was still down by approximately 12% relative to the U.S. dollar (USD) and 9% against the euro (EUR).
- The FTSE 250 (in GBP) (companies generating a higher proportion of revenues from the U.K. relative to the U.K. benchmark index FTSE 100), remained slightly below its pre-Brexit vote levels.
- The STOXX Europe 600 (in EUR), and the Euro STOXX Index also remained slightly below pre-Brexit vote levels.

Pockets of investors continued to look for safety:

- Gold prices increased in the weeks following the vote, although they appear to have recently stabilized.
- The yields on U.S. 10-year Treasury bonds and U.K. 10-year Gilts plunged to record lows.
- The yield on German 10-year Bunds turned negative for the first time ever.
- The yield on 10-year Japanese government bonds plunged further into negative territory.

For perspective, in relative terms the U.K. 10-year yield declined by almost half in the span of just three weeks, whereas the German 10-year yield fell threefold from its original level on Brexit vote day. More recently, yields have increased somewhat from their record lows but remain at historical low levels.

Commentators noted initially that the dramatic declines following the Brexit vote were caused by “flights to quality” – investors seeking to preserve the principal of their investments given the increased risks. Since then, continued investment demand for safe-haven bonds is also driven by investors’ expectations that major central banks around the world will implement new (or expand existing) quantitative easing (QE) policies, thereby supporting bond prices for the foreseeable future.

In addition, global expectations of long-term growth have been abating since the onset of the global financial crisis in 2008, which along with a low-inflation (or even deflationary) environment, suggest that nominal investment returns for equity securities may fall well-short of those realized over prior decades.

The remainder of this article will discuss issues confronting investors in valuing their investments in the current environment. We will use June 30, 2016 as a reference date, but also provide some more recent data.[2]

[2] The discussion in this section was based on information available at the time of writing (through July 25, 2016). See the section entitled “Subsequent Events” at the end of the article, for some changes that have occurred since then.

Section 03

Brexit Impact on Expected Cash Flows and Growth Rates

Impact of Brexit on Valuations

Impact of Brexit on Valuations

Uncertainty around the future of the U.K. is expected to have a negative impact on economic activity, investments, and confidence, primarily in the U.K. and the Eurozone.[3] This heightened uncertainty will have an impact in the valuation of investments generating cash flows in those geographies.

In simple terms, recall that the value of any investment is a function of three key inputs: (i) existing cash flows associated with the investment, (ii) expected growth in the projected cash flows, and (iii) the required rate of return (or discount rate) to convert the expected cash flows into their present value.

This section will focus on the adjustments that may be considered to expected cash flows and their growth post-Brexit, while the next section will focus on the impact on the discount rate.[4]

Expected Cash Flows and Growth Rates

Expected Cash Flows and Growth Rates

By definition, there will always be a certain degree of uncertainty in any valuation. After all, we are attempting to estimate what will happen in the future. However, periods of higher uncertainty can lead to diminished valuations, due to a higher distribution of potential outcomes where "bad" scenarios have a higher probability of occurring, and/or a higher required rate of return necessary to induce market participants to fund that investment.

In order to incorporate the incremental risk of Brexit in valuations, adjusting cash flow projections would be a preferable approach to the alternative of adding ad-hoc risk premiums (i.e. alphas) to discount rates. The increased uncertainty of potential outcomes may best be captured through the use of a scenario-based analysis, which would entail estimating (i) the cash flows expected under each scenario; and (ii) a probability factor associated with each of the scenarios.

Several economic consultancy firms, along with economists at global institutions, and investment advisory firms, have begun the difficult task of estimating the macroeconomic impact of various scenarios, which will depend ultimately on how the separation of the U.K. from the European Union unfolds.

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[3] The Eurozone consists of those member states of the European Union that have adopted the euro as their currency. Eurozone member states include the following 19 countries: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherland, Portugal, Slovakia, Slovenia, and Spain. In addition to the Eurozone members, the European Union (or EU) is comprised of Bulgaria, Denmark, Croatia, Czech Republic, Hungary, Poland, Romania, Sweden, and United Kingdom. Until the United Kingdom evokes Article 50 of the Lisbon Treaty, it will remain officially a member of the EU.

[4] The discussion in this section was based on information available at the time of writing (through July 25, 2016). Events and market conditions may have changed since then relative to when this article is issued.

In general, the various analyses we reviewed tend to bifurcate the Brexit impact in terms of short-term effects (two to three years) and long-term effects (after the U.K. formally notifies the EU that it is leaving, under Article 50 of the Lisbon Treaty).

The short-term effects to the U.K. are driven by an uncertain environment that will likely lead to a decline in consumer spending, business investment, and foreign direct investment; this, in turn, will likely result in lower employment and a drop in economic output (GDP, or Gross Domestic Product). The long-term effects will depend on the ultimate outcome of a trade deal between the U.K. and the EU.

To assist in evaluating the impact of Brexit on expected cash flows, we assembled data on forecasted growth of real GDP, as prepared by a variety of reputable sources, both before and after the Brexit vote. We have focused on changes in projected real GDP growth for three geographies: (1) the United Kingdom; (2) the Eurozone; and (3) the United States.[5]

Exhibit 1: Real GDP Estimates Before and After Brexit Vote (in percentage terms)

United Kingdom

	Before Brexit Vote			After Brexit Vote		
Source	**2016**	**2017**	**2018/LT**	**2016**	**2017**	**2018/LT**
Moody's Analytics	1.9	2.3	2.0	1.5	0.5	1.7
S&P Global Ratings	2.0	2.2	n/a	1.5	0.9	1.0
IHS	1.9	2.4	2.3	1.5	0.2	1.3
Consensus Economics	1.9	2.1	n/a	1.4	0.4	n/a
EIU	1.6	1.8	1.9	1.5	-1.0	0.7
Oxford Economics	1.8	2.3	2.2	1.8	1.1	1.4
IMF	1.9	2.2	n/a	1.7	1.3	n/a
Average of Forecasts	1.9	2.2	2.1	1.6	0.5	1.2
% Decline in Forecasts				*-16%*	*-78%*	*-42%*
Median of Forecasts	1.9	2.2	2.1	1.5	0.5	1.3
% Decline in Forecasts				*-21%*	*-77%*	*-38%*

(Continued Next Page)

[5] Sources: Moody's Analytics, "Brexit Fallout Webinar", 29 June 2016; S&P Global Ratings, "Economic Research: Europe's Economic Outlook After the Brexit Vote", dated 4 July 2016; S&P Global Ratings, "European Economic Snapshots" dated May 2016; S&P Global Ratings, "Economic Research: Independence Day?"; IHS, "Preliminary Global Economic Forecasts Show Heavy Brexit Impact", dated 27 June 2016;The Economist Intelligence Unit (EIU), "United Kingdom Country Report" dated 20 June 2016 and 1 July 2016; Consensus Forecasts, "A Post-Brexit Outlook Update", dated 28 June 2016; International Monetary Fund (IMF), "Euro Area Policies – Staff Report For The 2016 Article IV Consultation – Supplementary Information", dated 1 July 2016; IMF "World Economic Outlook Update – Uncertainty in the Aftermath of the U.K. Referendum", dated 19 July 2016.

Eurozone

Source	Before Brexit Vote			After Brexit Vote		
	2016	2017	2018/LT	2016	2017	2018/LT
Moody's Analytics	1.6	1.8	1.4	1.3	1.1	1.4
S&P Global Ratings	1.5	1.6	n/a	1.7	1.3	1.4
IHS	1.7	1.8	1.6	1.4	0.9	1.4
Consensus Economics	1.6	1.6	n/a	1.5	1.0	n/a
EIU	1.5	1.6	1.6	1.6	1.3	1.5
Oxford Economics	n/a	n/a	n/a	n/a	n/a	n/a
IMF	1.7	1.7	1.7	1.6	1.4	1.6
Average of Forecasts	1.6	1.7	1.6	1.5	1.2	1.5
% Decline in Forecasts				*-5%*	*-31%*	*-7%*
Median of Forecasts	1.6	1.7	1.6	1.6	1.2	1.4
% Decline in Forecasts				*-3%*	*-27%*	*-13%*

United States

Source	Before Brexit Vote			After Brexit Vote		
	2016	2017	2018/LT	2016	2017	2018/LT
Moody's Analytics	1.9	2.9	2.0	1.9	2.8	2.0
S&P Global Ratings	2.3	2.5	n/a	2.0	2.4	n/a
IHS	1.9	2.6	2.6	1.9	2.4	2.6
Consensus Economics	1.9	2.3	n/a	1.8	2.1	n/a
EIU	2.0	2.3	2.3	1.8	2.2	2.3
Oxford Economics	1.9	2.3	2.3	2.0	2.3	2.3
IMF	2.4	2.5	n/a	2.2	2.5	n/a
Average of Forecasts	2.0	2.5	2.3	1.9	2.4	2.3
% Decline in Forecasts				*-5%*	*-4%*	*0%*
Median of Forecasts	1.9	2.5	2.3	1.9	2.4	2.3
% Decline in Forecasts				*-1%*	*-4%*	*0%*

As one would expect, the U.K. is expected to suffer the largest negative impact (with a median 77% decline in 2017 real GDP growth), followed by the Eurozone, whereas the U.S. is expected to be minimally affected.

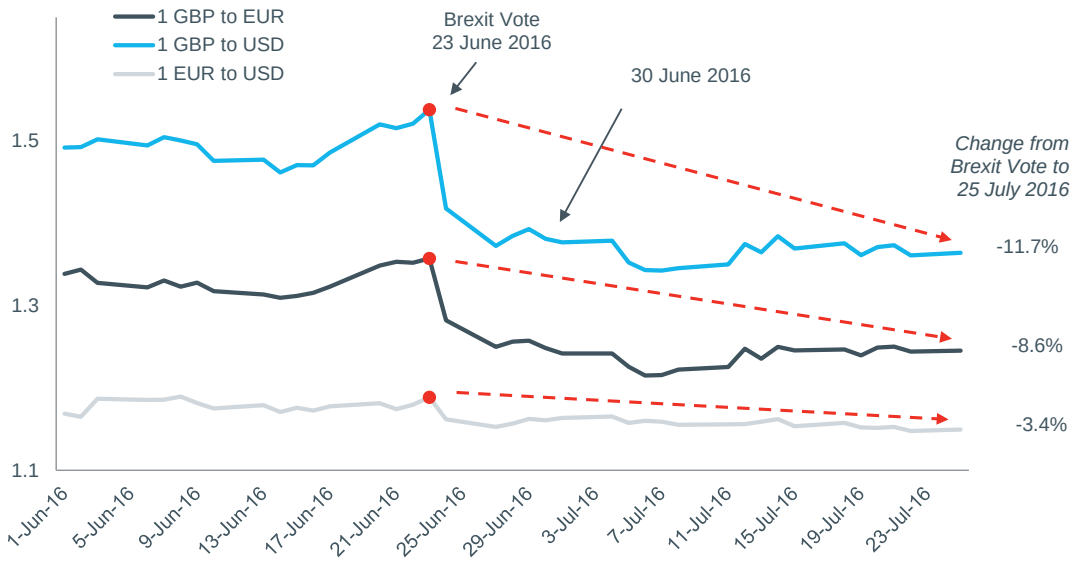
This significant deterioration of growth expectations will have a negative effect on many investments. Analysts should consider measuring exposure of individual investments to the U.K. and the Eurozone, and revise their projected cash flows accordingly.

But how?

The analyst needs to carefully evaluate the sources from where revenues and costs are generated, in order to quantify how the changes in real GDP growth will impact the subject company's expected cash flows. For example, the largest U.K. publicly-traded companies (members of the FTSE 100) only generate about 20% of their revenue from the U.K., while smaller mid-cap U.K. companies (members of the FTSE 250) generate about 50%.[6]

The FTSE 100 companies may actually benefit in the near to medium-term from the plunge in the value of the British pound against major currencies. Exhibit 2 shows the depreciation of the pound against the euro and U.S. dollar since the Brexit vote.

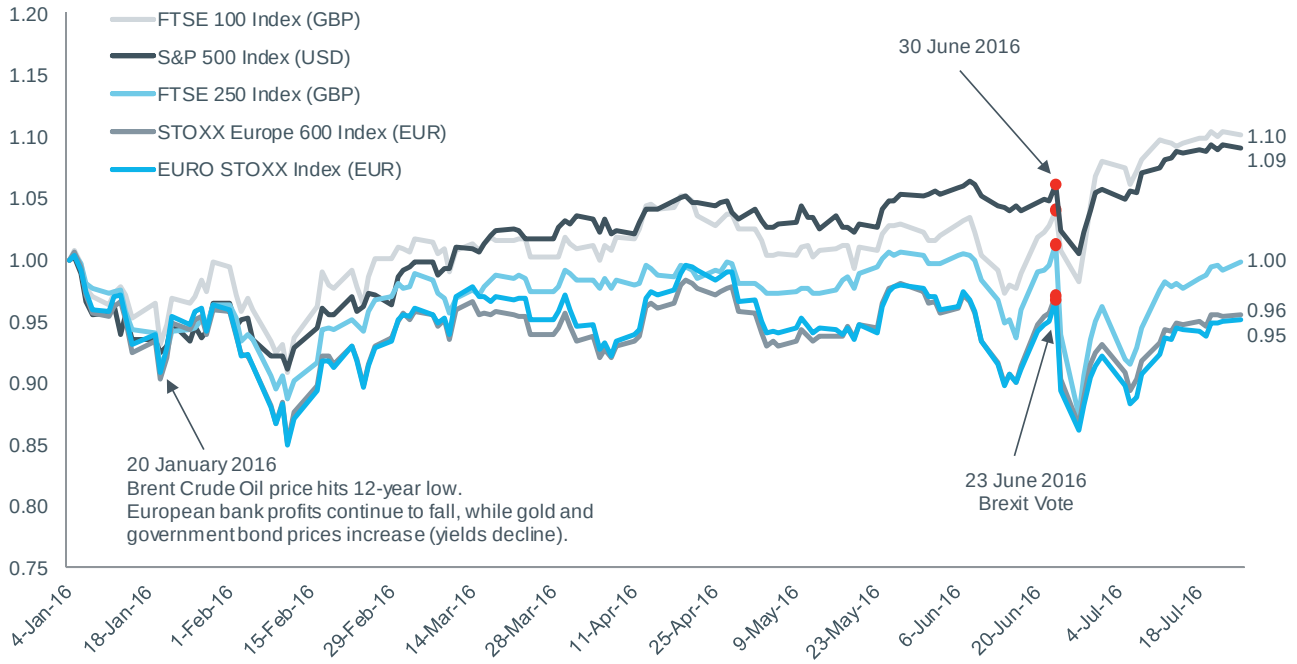
Exhibit 2: Fluctuation in the British Pound (GBP), Euro (EUR), and U.S. Dollar (USD) since Brexit Vote
June 1, 2016–July 25, 2016



[6] Michael Hunter, "UK's FTSE 250 has more to worry about than Brexit", FT.com, May 26, 2016.

For the moment, investors seem to anticipate that FTSE 100 companies will indeed benefit from the weaker pound. Since the Brexit vote until the present (thru the time of writing of this article), the FTSE 100 index has fully recovered its immediate post-Brexit vote losses, as can be observed in Exhibit 3.

Exhibit 3: Relative Performance of Major European and U.S. Stock Market Indices
January 1, 2016–July 25, 2016



The benefits from the substantial depreciation of the pound stem primarily from two sources. First, U.K. products become relatively cheaper to consumers and businesses in other countries. U.K. exports will likely increase as a result, should the current exchange rate levels remain the same.

Secondly, earnings generated abroad will be worth more when converted into pounds. For example, let us analyze a U.K. company selling its products to consumers in the United States. If the company had generated USD 150 of net cash flows just prior to the Brexit vote, they would translate into just over GBP 100 when repatriated back to the U.K. Today, however, those same cash flows would now be worth approximately GBP 115.

In that context, given the global footprint of the companies that comprise the index, it is not surprising to see a rebound in the FTSE 100 index. Nevertheless, the translation effect will benefit mainly U.K.-based investors in the FTSE 100. From a U.S. investor perspective, the effect will be the opposite, as returns will become smaller in U.S. dollar terms. This is precisely the struggle that U.S. multinationals have been facing for over a year, due to the continued strength of the dollar.

On the other hand, U.K. based companies generating most of their cash flows in the U.K. will likely suffer the most in the aftermath of the Brexit decision. These companies are more likely to see a decline in sales and net cash flows, as U.K. consumers and businesses reduce their spending due to the uncertain future business climate.

Two U.K. industries that are likely to be more negatively impacted include financial services and real estate. London is a global financial hub, with the financial services industry being a major contributor to the U.K.'s economic growth. Banks and other financial service companies headquartered in the U.K. are experiencing great uncertainty as to how they will be able to conduct business in the Eurozone under a yet-to-be negotiated new set of regulations. The housing and commercial real estate markets also stand to lose significantly from the separation. The uncertain environment will lead individuals to delay housing purchase decisions, while the commercial office space market will see an increase in vacancies as many companies are expected to relocate their businesses into Continental Europe.

Section 04

Brexit Impact on Cost of Capital Inputs

Impact of Brexit on Cost of Capital Inputs

Impact of Brexit on Cost of Capital Inputs

The Duff & Phelps' Brexit webinar "The Impact on Cost of Capital" coalesced on a main theme: the need to maintain internal consistency between the basic elements of valuation and the current economic environment.

To provide some perspective, let us refer back to Exhibit 3, which depicts the relative performance since January 2016 of major stock market indices in the U.S. and Europe. Exhibit 3 reveals that the impact of Brexit was not worse than the market turmoil felt in January and February 2016, when oil prices collapsed to 12-year lows and concerns about a slowing global economy and deflationary pressures hit financial markets.

Professor Damodaran (New York University Stern School of Business) communicated a similar message in the Duff & Phelps' Brexit webcast. In his words, Brexit is simply a "garden variety" crisis similar to others over the past five years, such as the crises in China, Russia, and Greece. According to him, to treat Brexit differently is a "mistake." He went on to advise valuation professionals to focus on being internally consistent between the three basic elements of valuation (expected cash flows, growth rate, and discount rate), rather than attempting to capture the effects of Brexit on each of the three elements separately. Professors Dimson and Fernández concurred. They also believed that being internally consistent was key to performing valuations in the current environment.

The remainder of this section will address some of the considerations that valuation professionals may have to tackle when estimating cost of capital inputs in a post-Brexit world.

Recall that the cost of equity capital is typically expressed as a function of the risk-free rate and the equity risk premium (ERP). A base cost of equity can be obtained by adding the risk-free rate to the ERP. Prior to discussing each of these building blocks, let us reiterate one very important concept: the risk-free rate and ERP are inextricably related and should not be thought of as independent or unrelated inputs.

The Risk-free Rate and Equity Risk Premium: Interrelated Concepts[7]

A risk-free rate is the return available, as of the valuation date, on a security that the market generally regards as free of the risk of default.

[7] Some sections of this discussion were extracted from Chapter 3 of the Duff & Phelps *2016 Valuation Handbook – Guide to Cost of Capital* (Hoboken, NJ: John Wiley & Sons, 2016). The discussion in this section was based on information available at the time of writing (through July 25, 2016). Events and market conditions may have changed since then relative to when this report is issued.

For valuations denominated in U.S. dollars, valuation analysts have typically used the spot yield-to-maturity (as of the valuation date) on U.S. government securities as a proxy for the risk-free rate. The two most commonly used risk-free bond maturities have been the 10- and 20-year U.S. government bond yields.

Similarly, for valuations denominated in British pounds, valuation analysts have typically used the spot yield-to-maturity on U.K. government securities (known as "Gilts") as a proxy for the risk-free rate. The two most commonly used risk-free bond maturities have been the 10- and 20-year U.K. government bond yields.

With regards to valuations denominated in euros, German government bonds have emerged as the benchmark for the risk-free rate. This has been particularly true since the height of the euro sovereign debt crisis (the "Euro Sovereign Crisis"), when several Eurozone countries lost their AAA credit rating status. Yields on 10- and 15-year German government bonds are commonly used when valuing a business.

The use of (i) long-term (safe) government bonds, and (ii) an ERP estimated relative to yields on long-term bonds, must closely match the investment horizon and risks that confront business managers who are making capital allocation decisions and valuation analysts who are applying valuation methods to value a "going concern" business.

The risk-free rate and the ERP are interrelated concepts. All ERP estimates are, by definition, developed *in relation* to the risk-free rate. Specifically, the ERP is the extra return investors expect as compensation for assuming the additional risk associated with an investment in a diversified portfolio of common stocks, compared to the return they would expect from an investment in risk-free securities.

This brings us to an important concept. When developing cost of capital estimates, the valuation analyst should match the term of the risk-free rate used in the CAPM or build-up formulas with the duration of the expected net cash flows of the business, asset, or project being evaluated. Further, the term of the risk-free rate should also match the term of the risk-free rate used to develop the ERP, as illustrated in Exhibit 4.

Exhibit 4: The Risk-Free Rate and ERP Should be Consistent with the Duration of the Net Cash Flows of the Business, Asset, or Project Being Evaluated

Term of risk-free rate used in CAPM or Build-up equation	=	Expected duration of the net cash flows of the business, asset, or project being evaluated	=	Term of risk-free rate used to develop the ERP

In many of the cases in which one is valuing a business, a "going concern" assumption is made (the life of the business is assumed to be indefinite), and therefore selecting longer-term bond yields (e.g. 20 years) as the proxy for the risk-free rate is appropriate.

The risk-free rate and the ERP, like all components of the cost of equity capital (and the cost of equity estimate itself), are *forward-looking* concepts. The reason that the cost of capital is a forward-looking concept is straightforward: when we value a company (for instance), we are trying to value how much we would pay (now) for the *future* economic benefits associated with owning the company. Since we will ultimately use the cost of capital to discount these future economic benefits (usually measured as expected cash flows) back to their present value, the cost of capital itself must *also* be forward-looking.

Building Blocks of Cost of Equity Capital: Risk-Free Rate

Spot Risk-Free Rates versus Normalized Risk-Free Rates – Beginning with the global financial crisis of 2008 (the "2008 Financial Crisis"), analysts have had to re-examine whether the "spot" rate is still a reliable building block upon which to base their cost of equity capital estimates. The 2008 Financial Crisis challenged long-accepted practices and highlighted potential problems of simply continuing to use the spot yield-to-maturity on a safe government security as the risk-free rate, without any further adjustments.

During periods in which risk-free rates appear to be abnormally low due to flight to quality or massive central bank monetary interventions, valuation analysts may want to consider normalizing the risk-free rate. By "normalization" we mean estimating a risk-free rate that more likely reflects the *sustainable* average return of long-term bonds issued by countries considered "safe" or risk-free.

Why Estimate a Normalized Risk-Free Rate?
The yields of U.S., U.K., and German government bonds in certain periods during and after the 2008 Financial Crisis (and later the Euro Sovereign Crisis) may have been *artificially* repressed, and therefore possibly unsustainable.

So what does it mean when someone says the current government bond yields for the U.S., U.K., or Germany are not "normal"? And even if interest rates are not considered "normal", why is that any different from other periods in history? Remember, the risk-free rate is intended to adjust the cost of equity capital for expected future inflation. Depending on the country, valuation analysts typically use a 10- or 20-year government bond yield when developing a cost of equity capital. Therefore, the risk-free rate should reflect an average expected return over those years.

Why isn't the Current Spot Risk-Free Rate Considered "Normal"?
It may be useful to first distinguish short-term drivers versus long-term trends in interest rates.

It is practically undisputed that aggressive monetary policies implemented as a response to the 2008 Financial Crisis and the Euro Sovereign Crisis drove long-term interest rates in the U.S. and several advanced economies to historically low levels. But many economists claim that the current low-rate environment is not just a cyclical story and that we can expect to see a lower level of interest rates in the long term (although not as low as today's). A number of explanatory factors and theories have emerged, some more pessimistic than others.

It is not our place to select which, amongst the various theories, is more (or less) correct. Instead, we suggest that valuation specialists read different sources to get acquainted with such theories.[8] It remains an open question whether the underlying factors linked to the currently low rates are transitory, or do they imply that the long-run equilibrium for long-term interest rates is lower than before the 2008 Financial Crisis. The bottom line is that the future path of interest rates is currently uncertain.[9]

So, for now, we will briefly mention some of the factors that may be keeping interest rates ultra-low in the near term.

An environment of geopolitical and economic uncertainty led to flight to quality movements during certain periods of 2015, which helped drive interest rates even lower for major safe-haven countries. Flights to quality were particularly acute in early 2016, as mentioned earlier.

Global investors had enough reasons to seek safe-haven investments over the last couple of years. In addition to geopolitical events, concerns about a slowing global economy and deflationary pressures have led global investors to seek safe-haven investments, such as government bonds issued by the U.S., U.K., Germany, and Switzerland, to name a few. Oil prices continued to tumble from their mid-2014 highs though January 2016, reinforcing investor anxiety over stagnant growth in the Eurozone and Japan, as well as a deceleration in China and several other emerging-market countries.

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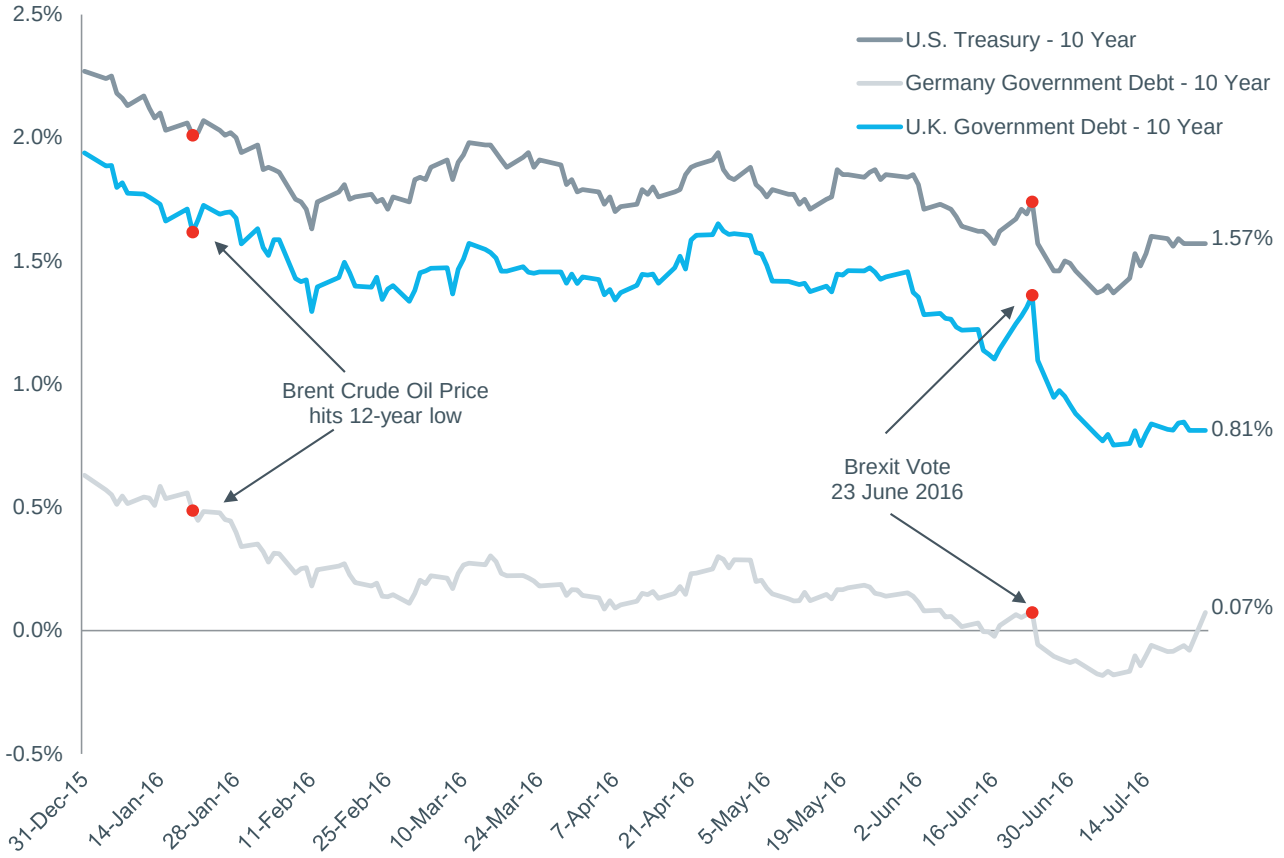
[8] For a discussion of some of these studies and factors to evaluate, refer to Chapter 3 of the Duff & Phelps *2016 Valuation Handbook – Guide to Cost of Capital* or to Duff & Phelps' Client Alert entitled "Duff & Phelps Increases U.S. Equity Risk Premium Recommendation to 5.5%, Effective January 31, 2016". To obtain a free copy of this Client Alert, visit www.duffandphelps.com/costofcapital.

[9] For an analysis of current long-term interest rates, see Jonathan Wilmot, "When bonds aren't bonds anymore", *Credit Suisse Global Investment Returns Yearbook 2016*, February 2016.

While there was some reprieve in financial markets after March 2016, the Brexit vote on June 23, 2016 renewed investor anxiety. The panic that immediately ensued, led 10-year yields on U.S., U.K., and German government bonds to sink to historical record lows. Exhibit 5 illustrates their trend since the end of 2015.

Exhibit 5: Yields on 10-Year Government Bonds Issued by the U.S., U.K., and Germany
December 31, 2015–July 25, 2016



Deflation risks and economic stagnation are precisely what led central banks in Japan and the Eurozone to recently boost their respective monetary easing policies. In a surprise move, the Bank of Japan (BOJ) announced on January 29, 2016, a landmark decision to implement a negative interest rate policy (dubbed "NIRP" in the financial press), in conjunction with its quantitative and qualitative easing (QQE) program.

The BOJ joined the European Central Bank (ECB), as well as the Danish, the Swedish, and the Swiss central banks in adopting this new form of unconventional monetary policies. The consequence of such measures is to pressure interest rates further downwards. According to an S&P research report:[10]

> *"Negative interest rate policy appears to be able to exert downward pressure on the whole yield curve via the portfolio rebalance effect, as security prices, perturbed by the central bank's fixing of one price, adjust to restore equilibrium."*

According to recent Bloomberg calculations, almost $10 trillion of government bonds globally offered negative yields in early July 2016.[11]

The Brexit vote increased the likelihood of further QE measures being implemented by the Bank of England, the ECB, and BOJ, which means negative rates may persist for a prolonged period of time. Negative or ultra-low rates present additional challenges when trying to estimate cost of capital inputs in the current environment.[12]

Methods of Estimating a Normalized Risk-free Rate – Estimating a normalized risk-free rate can be accomplished in a number of ways, including (i) simple averaging, or (ii) various "build-up" methods.

The first method of estimating a normalized risk-free rate entails calculating averages of yields to maturity on long-term government securities over various periods. This method's implied assumption is that government bond yields revert to the mean. In Exhibit 6, the solid blue line is the spot yield on a 20-year U.S. government bond (December 2007–June 2016), whereas the dashed dark-gray line shows a 3.6% average monthly yield of the 20-year U.S. government bond over the previous 10 years ending on June 30, 2016.[13] U.S. government bond spot yields at the end of June 2016 were lower than the monthly average over the last 10 years.

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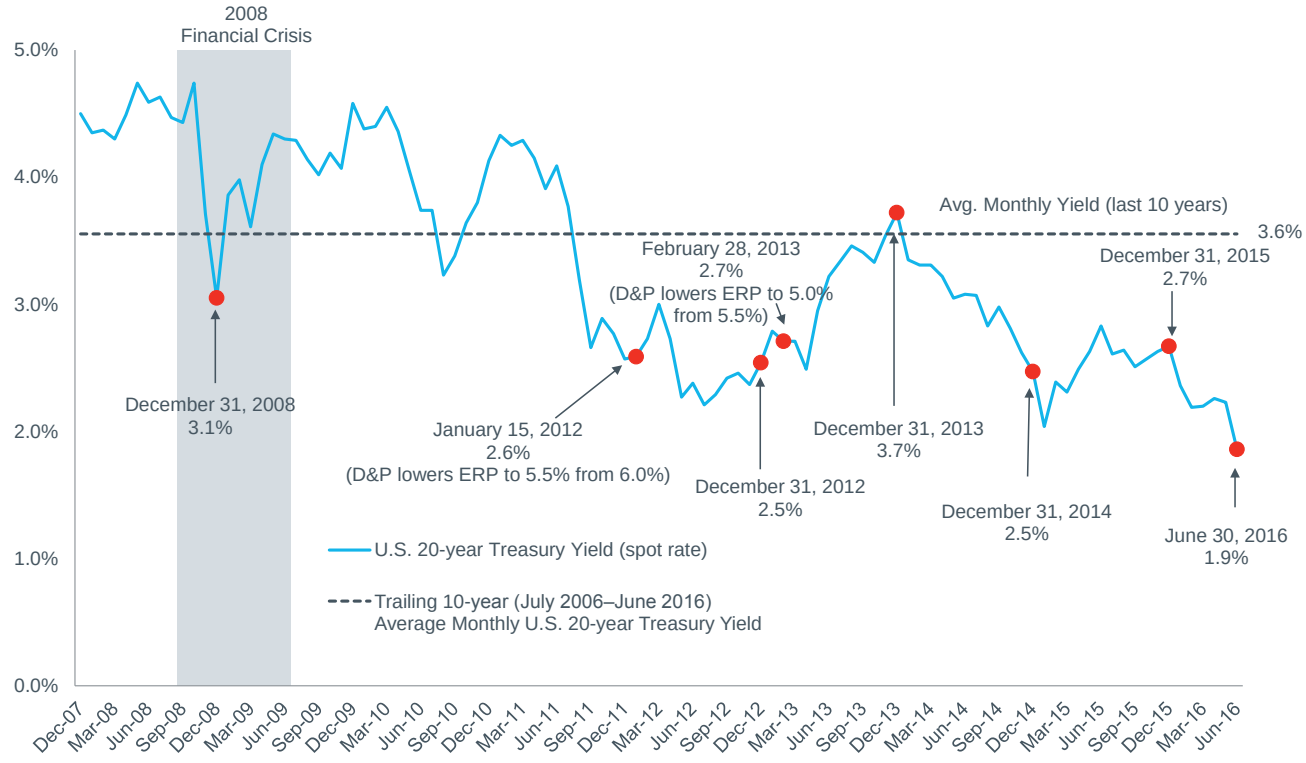
[10] Standard & Poor's *Ratings Direct* report entitled "Negative Interest Rates: Why Central Banks Can Defy 'Time Preference'", February 3, 2016.

[11] "Global Negative-Yielding Bond Pile Nears $10 Trillion: Chart", July 6, 2016. This article can be accessed here: http://www.bloomberg.com/news/articles/2016-07-06/global-negative-yielding-bond-pile-nears-10-trillion-chart.

[12] See the last section of this article, entitled "Subsequent Events", for an update on recent decisions by the Bank of England, the United Kingdom's central bank.

[13] Source of underlying data: 20-year U.S. government bond series. Board of Governors of the Federal serve System website at: http://www.federalreserve.gov/releases/h15/data.htm.

Exhibit 6: Spot and Average Yields on 20-year U.S. Government Bonds
December 2007–June 2016



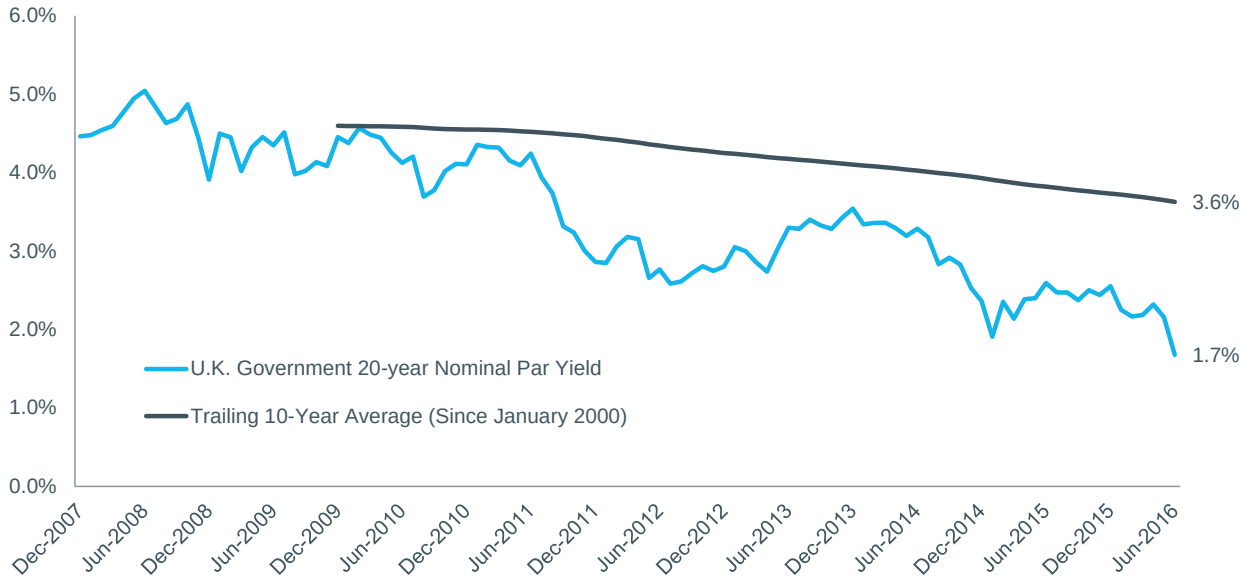
In Exhibit 7, we prepared a similar analysis for the U.K. The solid blue line is the spot yield on a 20-year U.K. government bond (end of December 2007 through end of June 2016), whereas the solid dark-gray line shows a 3.6% average monthly yield of the 20-year U.K. government bond over the previous 10 years ending on June 2016.[14]

The story here is very similar to that of the U.S. The spot yield on the 20-year U.K. government bond was lower at the end of June 2016 than the monthly average over the last 10 years. Actually, in the aftermath of Brexit vote yields declined significantly, despite the fact the U.K. lost its historical AAA sovereign credit rating as result of the decision.

Taking the average over the last 10 years is a simple way of "normalizing" the risk-free rate. An issue with using historical averages, though, is selecting an appropriate comparison period that can be used as a reasonable proxy for the future.

[14] Source of underlying data: 20-year nominal par yields on U.K. government bond series. Bank of England website at: www.bankofengland.co.uk/.

Exhibit 7: Spot and Average Yields on 20-year U.K. Government
December 2007–June 2016



The second method of estimating a normalized risk-free rate entails using a simple build-up method, where the components of the risk-free rate are estimated and then added together. Conceptually, the risk-free rate can be (loosely) illustrated as the return on the following two components:[15]

Risk-Free Rate	=	Real Rate	+	Expected Inflation

We assembled data from various sources for three bonds commonly used as inputs to cost of equity estimates, comparing the estimated normalized rates relative to the spot rates as of June 30, 2016 (note that spot yields have declined even further since then). We present the results of this analysis in Exhibit 8.

[15] This is a simplified version of the "Fisher equation", named after Irving Fisher. Fisher's "*The Theory of Interest*" was first published by Macmillan (New York), in 1930.

Exhibit 8: Long-Term Spot and Normalized Risk-Free Rates for U.S., U.K., and Germany[16] [17] [18]

	U.S.	U.K.	Germany
	20-Year Treasury Bonds	20-Year Gilts	15-Year Bunds
Expected Long-Term Real Risk-Free Rate	1.2%–2.0%	1.3%-2.6%	1.3%
Expected Inflation	1.7%–2.6%	1.0%–2.2%	0.9%–1.8%
Range of Normalized Risk-Free Rates	**2.9%–4.6%**	**2.3%–4.8%**	**2.2%–3.1%**
Mid-point	3.8%	3.6%	2.7%
Spot Rate	1.9%	1.7%	0.2%

Adding the estimated ranges for the "real" risk-free rate and longer-term inflation together produces an estimated normalized risk-free rate range of 2.9% to 4.6%, with a midpoint of 3.8% (or 4.0%, if rounding to the nearest 50 basis points) for the United States.

How should the analyst use this information? One can calculate the COE by either starting with a normalized risk-free rate or a spot rate. However, it's critical to match the second building block, the estimated ERP, to the selected risk-free rate. There must be internal consistency between these two inputs.

Building Blocks of Cost of Equity Capital: Cost of Equity

Recall that the ERP is the difference between expected rate of return on a fully-diversified portfolio of stocks and the expected rate of return on the risk-free security.

[16] U.S. Sources: *Credit Suisse Global Investment Returns Yearbook 2016*; The Livingston Survey dated June 8, 2016; Survey of Professional Forecasters, Second Quarter 2016; Cleveland Federal Reserve, news release dated 16 June 2016; *Blue Chip Financial Forecasts* dated 1 June 2016; *Blue Chip Economic Indicators* dated 1 March 2016; Philadelphia Federal Reserve, Aruoba Term Structure of Inflation dated June 2016; the University of Michigan Inflation Expectations dated June 2016.

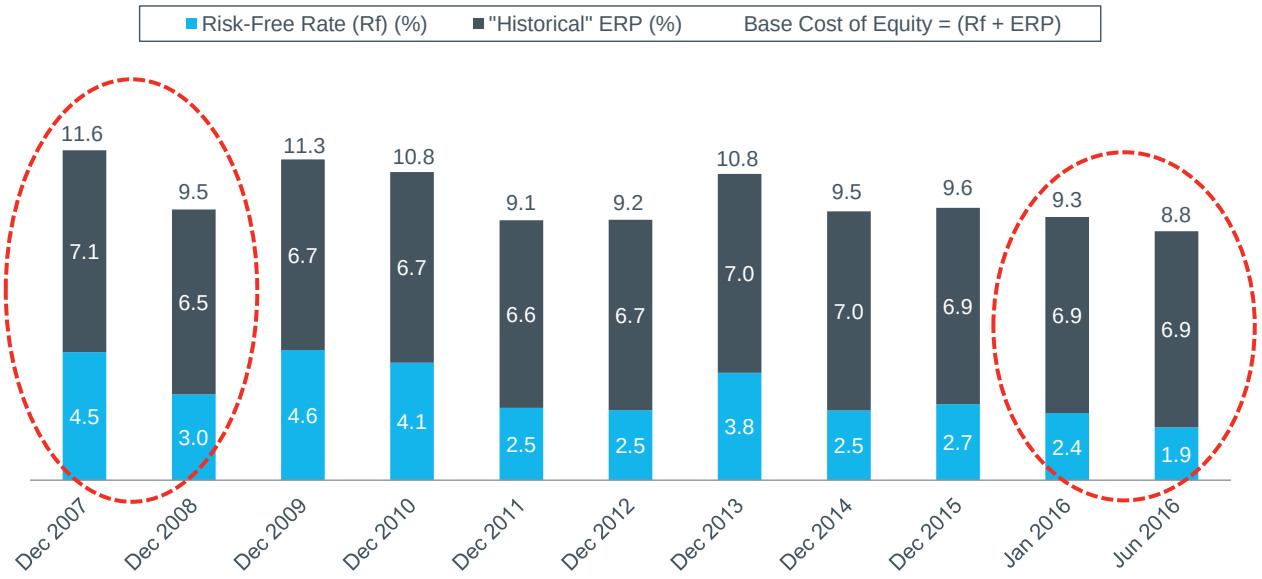
[17] U.K. Sources: *Credit Suisse Global Investment Returns Yearbook 2016*; Bank of England, Statistical Interactive Database; EY ITEM Club Spring 2016 Forecast; PwC's Global Economic Watch dated June 2016; IMF World Economic Outlook dated April 2016; OECD Economic Outlook No. 99 dated June 2016; The Economist Intelligence Unit (EIU) UK Country Report dated 1 July 2016; Consensus Forecasts: Global Outlook dated 28 June 2016; IHS: UK referendum – Global forecast implications dated 27 June 2016.

[18] Germany Sources: *Credit Suisse Global Investment Returns Yearbook 2016*; PwC's Global Economic Watch dated June 2016; S&P *Ratings Direct*: Europe's Economic Outlook after Brexit Vote dated 4July 2016; IMF World Economic Outlook dated June 2016; OECD Economic Outlook No. 99 dated June 2016; Oxford Economics: Germany Country Economic Forecast dated June 2016; EIU Germany Country Report dated June 2016; Consensus Forecasts: Global Outlook dated 28 June 2016; IHS: UK referendum – Global forecast implications dated 27 June 2016.

If one uses a spot rate artificially kept low by actions of central banks and flights-to-quality, but continues to use a long-term average historical ERP to calculate the base cost of equity, one may end up with nonsensical results.

Exhibit 9 shows the potential problems of simply using the spot yield-to-maturity on 20-year U.S. government bonds in conjunction with unadjusted U.S. historical equity risk premia. The long-term historical realized ERP since 1926 based on the S&P 500 is a common source of historical ERP estimates. That historical ERP is added to the spot 20-year yield on U.S. Treasuries, to arrive at a base cost of equity for each year. Data is displayed for year-end 2007 through year-end 2015, as well as end of June 2016 for the United States.[19]

Exhibit 9: Spot 20-year U.S. Treasury Yield in Conjunction with Unadjusted "Historical" Equity Risk Premium
December 2007–June 2016



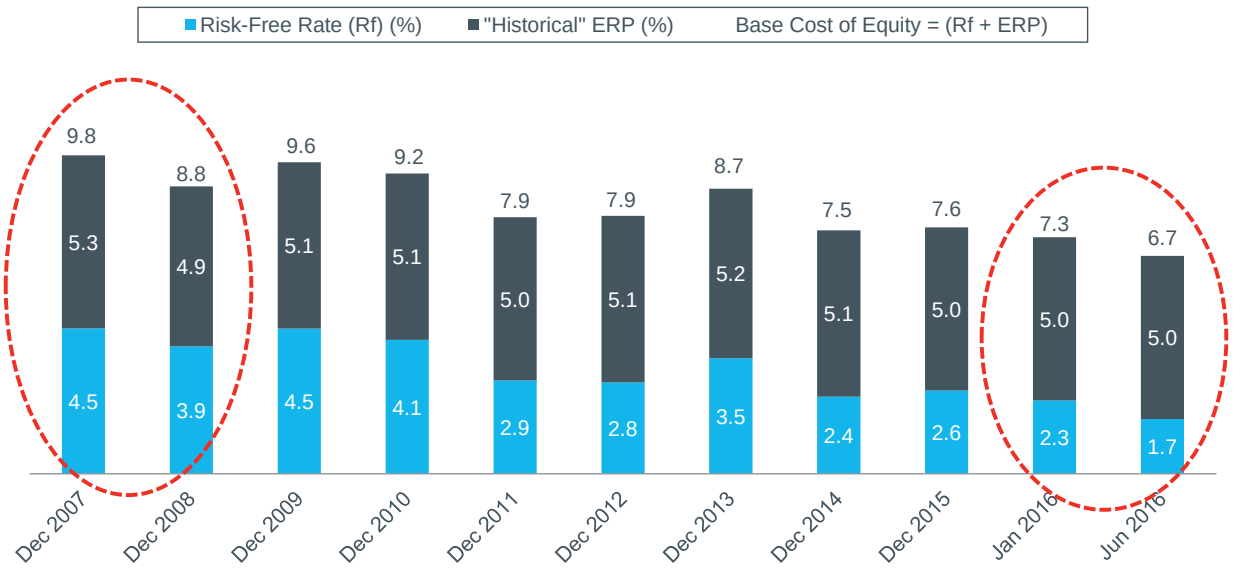
[19] Source of underlying data: Morningstar *Direct* database. Used with permission. Risk-free rate data series used: Long-term Gov't Bonds (IA SBBI US LT Govt YLD USD). All rights reserved. Calculations performed by Duff & Phelps LLC.

For example, in December 2008, at the height of the 2008 Financial Crisis (when risks were arguably at all-time highs), using the 1926–2008 historical ERP of 6.5% together with the spot 20-year yield of 3.0% would result in a base cost of equity capital of 9.5%. In contrast, the base cost of equity would be 11.6% (4.5% plus 7.1%) at year-end 2007, implying that risks were actually higher at the end of 2007 than at the end of 2008. From both a theoretical and practical standpoint, the reality is that investors likely perceived risks to be much higher in December 2008, relative to the December 2007.

A similar pattern emerged at June 30, 2016, with this method implying a decline in base cost of equity to 8.8%.

Using a similar methodology, Exhibit 10 depicts the spot yield-to-maturity on 20-year U.K. government bonds, which are then used in conjunction with unadjusted U.K. historical equity risk premia (computed in British pounds). That historical U.K. ERP is added to the spot 20-year U.K. Gilt yield, to arrive at a base cost of equity for each year. Data is displayed for year-end 2007 through year-end 2015, as well as end of June 2016.[20]

Exhibit 10: Spot 20-year U.K. Gilt Yield in Conjunction with Unadjusted "Historical" Equity Risk Premium
December 2007–June 2016



[20] Source of underlying data: 20-year nominal par yields on U.K. government bond series. Bank of England website at: www.bankofengland.co.uk/. Historical ERP computed in local currency terms since 1900, as reported in the *2016 International Valuation Handbook – Guide to Cost of Capital*.

This demonstrates that a mechanical application of the data may result in nonsensical results. The valuation analyst must then ask: did the risks in the future cash flows really decline? If not, then the ERP must have increased, such that the base cost of equity remains approximately the same.

To be clear, in most circumstances we would prefer to use the "spot" yield on safe government bonds available in the market as a proxy for the risk-free rate. However, during times of flight to quality and/or high levels of central bank intervention, those lower observed yields imply a lower cost of capital (all other factors held the same) – just the opposite of what one would expect in times of relative economic distress – so a "normalization" adjustment may be considered appropriate. By "normalization" we mean estimating a rate that more likely reflects the sustainable average return of long-term risk-free rates. *If spot yield-to-maturity were used at these times, without any other adjustments, one would arrive at an overall discount rate that is likely inappropriately low vis-à-vis the risks currently facing investors.*

Adjustments to the ERP or to the risk-free rate are, in principle, a response to the same underlying concerns and should result in broadly similar costs of capital. Adjusting the risk-free rate in conjunction with the ERP is only one of the alternatives available when estimating the cost of equity capital.

For example, one could use a spot yield for the risk-free rate, but *increase* the ERP or other adjustment to account for higher (systematic) risk. If the valuation analyst chooses to use the spot yield to estimate the cost of capital during periods when those yields are less than "normal," the valuation analyst must use an estimated ERP that is *matched* to (or implied by) those *below-normal* yields. However we note that the most commonly used data sources for ERP estimates are long-term series measured when interest rates were largely not subject to such market intervention. Using those data series with an abnormally low spot yield creates a mismatch.

Duff & Phelps examines a variety of economic and financial market indicators each month in order to estimate a recommended U.S. ERP, which is expressed relative to a normalized risk-free rate. This ERP estimate can be converted into a premium relative to the spot risk-free rate. For example, as of December 31, 2015 and January 31, 2016 we reported the following recommended base cost of capital inputs for U.S. companies with cash flows estimated in U.S. dollars.[21]

[21] Chapter 3 of the *2016 Valuation Handbook – Guide to Cost of Capital*.

4.0%

The Duff & Phelps concluded normalized risk-free rate, as of January 31, 2016

	December 31, 2015	January 31, 2016
ERP	5.0%	5.5%
Normalized 20-year U.S. Treasury Yield	4.0%	4.0%
Estimated base cost of equity	9.0%	9.5%

We can express these estimates relative to a spot 20-year U.S. Treasury bond yield as follows:

5.5%

The Duff & Phelps U.S. Equity Risk Premium Recommendation effective January 31, 2016

	December 31, 2015	January 31, 2016
Indicated ERP	6.3%	7.1%
Spot 20-year U.S. Treasury Yield	2.7%	2.4%
Estimated base cost of equity	9.0%	9.5%

As of June 30, 2016, when markets had begun to settle down, our analysis indicated that for investments with cash flows denominated in U.S. dollars, the recommended ERP as of January 31, 2016 should continue to be used.

Conclusion

Matching expected return to risk remains an inexact exercise. It is critical to maintain internal consistency between assumptions, when conducting a valuation. One must estimate growth in cash flows consistent with current expectations. And in discounting those expected net cash flows, one must use an expected base cost of equity that matches expected return to the expected risks.

Professor John Cochrane summarized our knowledge of estimating rates of return for equity over the last 40 years as follows:[22]

> *"The puzzles and anomalies that we face amount to discount rate variation we don't understand. Our theoretical controversies are about how discount rates are formed….Theories are in their infancy…."*

[22] John C. Cochrane, University of Chicago Booth School of Business, "Discount Rates," American Finance Association Presidential Address, January 8, 2011. http://faculty.chicagobooth.edu.john.cochrane/research/papers

Section 5

Subsequent Events

Latest Developments

Economic and Equity Market Developments

Two and half months after the U.K. vote to leave the European Union, a myriad of articles have been published in the press trying to analyze the effects of Brexit.

Several analysts have called Brexit the biggest non-event of the year. Supporting this argument, analysts will cite the recovery of broad equity indices, such as the FTSE 100 and FTSE 250, of all the losses suffered in the weeks that followed the Brexit vote. In addition, certain August economic indicators such as U.K. consumer spending and investment registered strong readings, suggesting the negative impact may have been temporary. The natural conclusion may be that the short-term impact of the Brexit vote is less severe than many had previously believed and that the immediate reaction by financial markets was overblown.

However, on the other side of the spectrum, some economists and market analysts will point out that this recent data does not completely rule out any negative short-term impact. The reality is that it is still too early to ascertain what the ultimate impact will be to the U.K. economy. In fact, the United Kingdom may well end up enduring significant GDP losses, as originally predicted by economists and analysts (see earlier section “Brexit Impact on Expected Cash Flows and Growth Rates”).

According to some, it is the exit from the European Union – not the initial vote to leave – that will bring about those losses. The speed of departure will dictate whether losses are concentrated over a few years or will be extended over a long period of time.[23]

A recent report by Standard & Poor’s cautioned that any optimistic inferences from the latest rebound may be premature and that downside risks are substantial:[24]

> *“Any celebration about the rebound in August and conclusion that life has returned to "business as usual" may prove to be premature or even a mirage. The uncertainty surrounding the U.K's future outside of the E.U. and the associated economic risks, which we think are pronounced and predominantly skewed to the downside, is likely to gradually take its toll, particularly on investment, as businesses start dealing with the new Brexit reality.”*

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[23] See, for example, “The Not-So-High Costs of Brexit”, by Daniel Gros, Project Syndicate, September 8, 2016. This article can be accessed here: https://www.project-syndicate.org/commentary/overblown-costs-of-brexit-by-daniel-gros-2016-09.

[24] Standard & Poor’s *Ratings Direct* report entitled “Economic Research: The U.K. Economy Makes A Show Of Brexit Resilience, But Can It Last?”, September 12, 2016.

In fact, a recent article published by Reuters, using data from Thomson Reuters, documents a significant decline in mergers and acquisitions (M&A) activity following the Brexit vote. The number of deals involving U.K. companies dropped to 707 in the 11 weeks since the Brexit vote. That was a decline of 33% when compared to the 1,060 deals in the same period of last year of pending and completed M&A transactions. Similarly, the total deal value plummeted by 30% over the same period (from $125.2 billion to $87.4 billion). According to the same article, the number of deals involving U.K. companies and the number of deals where U.K. companies were takeover targets both fell to their lowest level in at least two decades.[25]

This trend highlights that uncertainty regarding the impact of Brexit has reached corporate boards, which may lead to a delay in major expansion and capital expenditure decisions.

Interest Rate Developments

As predicted by market participants (see earlier section "Brexit Impact on Cost of Capital Inputs"), the Bank of England unveiled a new round of monetary easing policies to support the U.K. economy. On August 3, 2016, the Bank of England voted to introduce the following measures:[26]

- A 25 basis-point cut in the Bank of England's benchmark interest rate (i.e., the Bank Rate) to 0.25%.
- Purchases in the amount of (up to) GBP 10 billion of GBP-denominated non-financial investment-grade corporate bonds, issued by firms making a material contribution to the U.K. economy (as defined by the Bank of England).
- An increase in the volume of purchased U.K. government bonds by GBP 60 billion, increasing holdings to a total of GBP 435 billion

The Bank of England rate cut was the first in seven years, as part of an effort to drive down borrowing costs and encourage consumers and companies to shift their cash into the real economy. As conveyed in a recent Bank of England report:[27]

> *"In the United Kingdom, some of the fall in yields seen recently may have reflected growing expectations of an expansion in the asset purchase programme. That reduces the benchmark rates used to determine borrowing costs for households and companies."*

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[25] Guy Faulconbridge; Holton, Kate; and MacAskill, Andrew. "Brexit chills M&A activity despite some big deals, data shows", Reuters: United Kingdom Edition. This article can be accessed here: http://uk.reuters.com/article/uk-britain-eu-m-a-insight-idUKKCN11I25V?il=0&mod=djemCFO_h

[26] Other lending facility measures were also introduced. Refer to "Inflation Report", Bank of England, August 2016. This report can be accessed here: http://www.bankofengland.co.uk/publications/Documents/inflationreport/2016/aug.pdf..

[27] Ibid.

The overall impact of these events is a

continued distortion in financial markets

for the foreseeable future

The impact of these measures has been to keep U.K. interest rates at historical lows, both for government and investment-grade bonds. These policies will drive the interest rate outlook for the foreseeable future.

While QE purchasing programs pushes bond yields down, it may also mean that volatility increases in the future, as the market becomes less liquid. As central banks own an increasing share of outstanding government bonds, a bond shortage appears to have more pronounced effects on yields than previously.

For example, the Financial Times reported that U.K. government bond yields collapsed on August 8, as it became apparent to market participants that the demand from the Bank of England was outstripping the supply of bonds available for purchasing, pushing the yield on benchmark 10-year Gilts to an all-time low.[28]

While the second attempt by the Bank of England to purchase bonds was more successful, this does underscore the shortage of eligible financial assets to fulfill the central bank's program. This problem is also being faced by central banks in Japan and the Eurozone.

The overall impact of these events is a continued distortion in financial markets for the foreseeable future. Anyone valuing investments in the current environment will have to at least consider whether adjustments are warranted when estimating expected cash flows and discount rates in the post-Brexit world.

[28] Elaine Moore; Cumbo, Josephine. "Bank of England bond-buying programme hits trouble", FT.com, August 9, 2016. This article can be accessed here: http://www.ft.com/cms/s/0/681cc244-5e2e-11e6-bb77-a121aa8abd95.html#axzz4KGQnOkmk

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