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Agenda

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Dealing with uncertainty: how to encourage investment in NGA networks?

There has been a good deal of debate globally on how to encourage telecoms operators to invest in next-generation access networks. To date, regulatory debate on the financial framework for NGA networks has focused largely on the required risk premium, although few concrete proposals have been put forward on its actual implementation. How can regulators ensure a market framework with a sufficient business case for fibre investment?

A number of European telecoms operators have recently announced plans to deploy fibre access networks (hereafter referred to as NGA (next-generation access) networks). Critical to the success of such investment plans is a clear market regulatory framework, which is acceptable for all stakeholders, including existing operators, potential entrants, consumers and governments, and which provides a net present value (NPV)-positive opportunity for investors.[1]

An important element of the framework is the 'rules of the game' provided by the future regulatory regime for NGA products. Importantly, the profitability of NGA investments and operators' commercial strategies, in terms of the scale of investments, choice of technology, coverage, product range and pricing, would be uncertain until the rules of the game provided by the regulatory regime are set out.

The main focus of the debate has been on what should be the appropriate risk-reflective return for NGA networks. This debate has been particularly lively since September when the European Commission published its Draft Recommendation for the regulatory framework for NGA networks, which sets out its view that NGA network investments warrant a project-specific risk premium that would remain, and that the pricing regime should remain consistent over time.[2]

While the appropriate risk premium has been discussed at length, thus far few concrete proposals have been put forward on what would be the underlying mechanisms that influence the relative risk of fibre-based access compared with more traditional public switched telephone networks (PSTN), and how the demand uncertainties could be taken into account when deriving regulated access charges. Furthermore, other regulatory considerations, beyond the required rate of return, are at least equally important in the market framework for NGAs. Indeed, in the case of NGAs, focusing only on the level of the allowed return may not be sufficient for ensuring investments. This is because NGA network investments differ from 'normal' utilities in that the allowed returns incorporated in price controls may not in themselves drive investments, primarily because of significant uncertainty of future demand.

This article explores some of the regulatory considerations relating to NGA networks, and examines what drives the risk premium for such networks and how this should be reflected in the regulatory regime. While it is a key regulatory objective to retain the competition inherent in the current framework, the focus of this article is on cost recovery and compensation for NGA risk—the fundamental factors required for investment to take place.

NGA investments: implications for the appropriate market framework

First and foremost, NGA networks represent an unprecedented 'greenfield' investment project with uncertain demand. Indeed, prior to discussing the pricing regime, it is important to understand the role of demand risk, which is the key attribute affecting the regulatory treatment of NGA networks.

In contrast to the copper access networks that have been used in the provision of 'tried-and-tested' products (eg, fixed telephony and ADSL), the revenues generated with fibre to the home/premises/cabinet/node (FTTx) networks are dependent on customer willingness to pay for capacity that enables them to receive bandwidth-hungry content. However, this may be challenging to forecast at this stage of development of the telecoms industry (eg, demand for high definition/Internet protocol

TV).[3] Should the fibre-access assets be used to provide primarily legacy-level services (ie, the demand for new incremental bandwidth would not materialise), the additional investment would effectively become stranded.

From a financial perspective, the combination of the greenfield nature of the investment with the uncertain demand means that there are two sources of risk in NGA network investments.

– **Spread of potential outcomes of demand**. This is risk in the financial sense, and refers to the spread of potential outcomes around the expected value. The wider the spread (ie, variance), the greater the risk. In this respect, to the extent that products provided over NGA networks are likely to have a greater elasticity of demand, this would increase the demand risk for the NGA products relative to the legacy products.[4] Indeed, it may be that among residential users, the high-speed connections will remain a 'luxury product', and that the demand for additional bandwidth will be strongest with business customers—the two factors pointing to higher price and income elasticities for FTTx, a finding also suggested by as yet relatively limited empirical evidence on this issue.[5]

– **Uncertainty with respect to the shape of distribution of demand**. The greenfield nature of the NGA network investment implies that there is considerable uncertainty with respect to the distribution of future demand, due to the limited market testing of super-fast broadband investments.

The combination of these two types of uncertainty means that not only is demand risk for NGA products likely to be greater than for products offered through the legacy networks, but there is also uncertainty with respect to the extent of the demand risk itself.

This feature of NGA network investments has implications for the future market framework. More specifically, investors would seek to recover the premium for risk in the financial sense (ie, variance of potential outcome around the expected value), as well as an extra premium for the fact that the distribution of demand is unknown in the first place. A parallel could be drawn with insurance products, where limited statistical information on a given risk event increases the required insurance premium.

In this respect, the regulatory framework should provide investors with adequate investment incentives and enable them recover the required compensation for risks. Demand uncertainty affects the way the regulatory framework needs to be implemented to provide sufficient compensation for investors, in terms of return *of*, and return *on*, capital. These two concepts are discussed below.

Ensuring the appropriate return *of* capital given demand uncertainty

As yet, the regulatory debate on the financial framework for NGA networks has focused largely on the required risk premium and the potential uplift of the cost of capital. Although this is a critical element of price regulation, it is not sufficient to ensure a market framework that does not distort the scope of an NPV-positive investment opportunity for NGA networks.

An appropriate regulatory regime needs to be consistent with a number of key principles, including the following:

– cost recovery;
– allowed return reflecting risk;
– consistent ex ante and ex post structure of regulation;
– compensation over the lifetime of investment;
– a level playing field.

Two of these points are illustrated below: cost recovery and compensation over the lifetime of the investment.

Ensuring cost recovery under uncertainty

The principle of cost of recovery is that, ex ante (ie, before the investment decision), investors need to expect to recover the value of the original investment over its lifetime. The compensation for risks (the cost of capital) should be provided over and above the expected recovery of investment.

This would have to be reflected in the appropriate regulatory regime. While charge controls typically draw on expected demand projections, in the case of NGA networks the spread between the forecast upside and downside would need to be considered, given high demand uncertainty and elasticity.

Given the elasticity of demand for NGAs, it is possible that in the downside scenario investors would not be able to price up to the price cap. This means that any price cap would need to provide sufficient headroom to compensate investors in the upside scenario for expected under-recovery in the downside scenario. This would ensure that investors expect to break even on average.

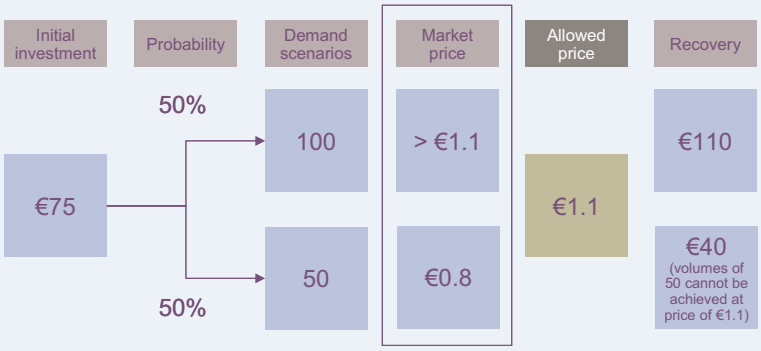
Hence, the probability of the downside scenario occurring, as well as the level of demand and achievable market price if it were to occur, would need to be estimated when setting the price cap.

The logic of cost recovery under uncertainty of demand is illustrated in the box below.[6]

Cost recovery and return of capital

Figure 1 illustrates how the allowed price could be set in order to ensure that investors expect to break even in the presence of volume risk. It shows a stylised project characterised by an up-front investment of €75, and uncertainty over the future level of demand (with probability of 50%, the demand could be 100 units or 50 units). The allowed price should in theory be set such that the expected recovery equals the value of the original investment, given the expected volume and the demand elasticities, which in this example would result in a price equal to €1.1. Note that the allowed price is adjusted to be higher than it would be if it were based on expected demand only (ie, €1.0). This is because the firm would not be able to charge up to the price cap of €1.0 if the low demand scenario were to occur.

Figure 1 Allowed price sufficient for investors to break even



Source: Oxera.

What is the appropriate compensation over the lifetime of investments?

An appropriately designed regulatory regime needs to ensure that investors are compensated for risks over the lifetime of the investments.[7]

Ex ante (before the investment decision), in order for investors to commit capital, they need to expect to break even on average and earn a return on capital as compensation for risk. Ex post (at the end of the investment period), if the expected (average) scenario occurs, investors recover the value of the original investment and earn the required return. If the upside scenario occurs, however, the actual return would exceed the required return, while if the downside scenario occurs, investors would earn less than the required return and may not recover even the original investment. The difference between the outturn and required returns in different ex post scenarios reflects risks that investors take at the onset of the investment.

It has been suggested that the allowed return could be revised after a certain regulatory period, given that the uncertainty of the distribution of future demand may decrease over time, as firms (and indeed national regulatory authorities) obtain more information on the uptake of high-speed services.[8] In effect, regulators may be tempted to lower the allowed weighted average cost of capital as the actual distribution of demand becomes more certain.

While this approach may be appropriate for new investments, revisions to the allowed return midway through the life of existing investments would affect the ex ante profile of the investment, and may not allow investors to expect to recover the original investment and earn the required return.

All else being equal, the appropriate compensation for risks should be based on the lifetime cost of capital, even in an environment where risks may be changing during the lifetime of the project. In the event that the regulatory regime is such that the allowed return, which is set ex ante, is revised ex post, such revisions may either need to be symmetrical (ie, revisions downwards in the upside scenario should be accompanied with support mechanisms in the downside scenario), or up-front compensation may need to be included in the allowed price for the value implications of subsequent changes in the allowed price. This is illustrated in the box below.

Hence, in the event that the regulator is not able to commit to a certain regulatory regime throughout the lifetime of the NGA network investment—eg, due to the periodical nature of the EU Framework, whereby regulators have to conduct a market review on a regular basis—an additional risk for investors would need to be incorporated in the regulatory regime.

What is the appropriate return *on* capital?

The appropriate cost of capital for the NGA network needs to be commensurate with risks. In addition to demand risk—which is the key risk driver discussed in this article—there is an array of factors that lead to risk differentials between NGAs and legacy networks, including differences in cost structures and CAPEX intensity, evolving market structure, product migration and pricing strategies.[9] While there has been a number of statements from various stakeholders about the potential uplift in allowed returns, fairly little has been said about its concrete implementation.

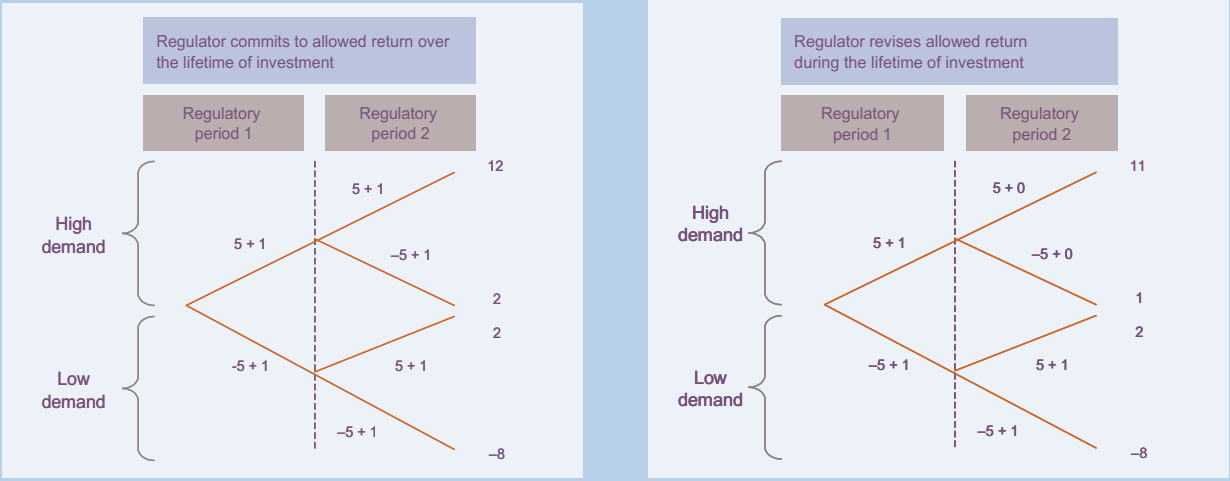
Allowed returns over the lifetime of the investment

Figure 2 illustrates how an ex post revision to the allowed price midway through the economic life of the investment may distort the investor's decision ex ante. For the sake of simplicity, assume that the economic life of an asset is two years, and there is a regulatory review after the first year. When demand is high, the investment is expected to generate €5 of revenue, while in the low demand scenario the relative losses are correspondingly €5. The ex ante required returns are those that are expected to be obtained at the end of the lifetime of the investment, in this case €2.

A scenario where the regulator commits to a fixed rate of return (€1) throughout the lifetime of investment is illustrated in the figure on the left. In this case, the investor obtains the expected return of €2 on average. On the other hand, if the regulator allows a return of €1 for the first period, but changes the regulated returns in the event that demand proves high (the allowed rate of return changes to zero), the investor recovers on average €1.5.

This is lower than the level of return required by the investor ex ante and hence the investment would not occur due to the distortions created by the regulator's lack of commitment to the ex ante level. In this case, it would be appropriate to provide an ex ante compensation of €0.5 to enable the investor to expect to break even and earn the required return.

Figure 2 Regulatory reviews and expected returns



Source: Oxera.

So are the risk differentials too difficult to quantify robustly? The required returns are typically measured using asset pricing models, the capital asset pricing model being the most commonly applied in regulatory settings and also recommended by the European Commission when deriving the cost of capital for operators investing in NGA networks.[10] The application of these models requires historical data on returns for investments with similar risk characteristics to the project in question.

In the case of NGA investments, the problem is the limited number of comparators and directly suitable market data. Therefore, risk drivers would need to be identified from a bottom-up perspective, and the analysis could then be supplemented with the application of asset pricing models based on market data. In this respect, there are advanced techniques available that could be applied to overcome the above-mentioned challenges. For example, decomposition methodologies could be applied to separate the effects of business decisions with different risk profiles in beta estimation.

Conclusions

The critical factor for the successful roll-out of NGA investment is the market framework, an important element of which is the regulatory regime. There are a number of principles with which an appropriate regulatory regime needs to be consistent. In addition to a premium for risk in NGA networks, the regulatory regime would need to ensure that it provides appropriate compensation for the return *of* capital.

Given the nature of risks of NGA network investments—ie, a greenfield investment project with uncertain demand—investors would expect compensation for risks in the financial sense, as well as an additional premium for limited market testing. These characteristics would affect both the appropriate return *of* capital and return *on* capital. NGA investment involves more than simply replacing existing copper assets. Demand conditions show greater uncertainty for future services over NGA networks than services provided over the PSTN network. As a result, the regulatory regime would need to provide commitment and incorporate appropriate principles for both return *on* and return *of* capital.

[1] For example, BT has announced that it will invest £1.5 billion to roll out fibre-based broadband, although this is subject to symmetric treatment between operators and adequate compensation for investors. BT (2008), 'BT Plans UK's Largest Ever Investment in Super-fast Broadband', July.
[2] European Commission (2008), 'Draft Commission Recommendation of […] on Regulated Access to Next Generation Access Networks (NGA)', September.
[3] See, for example, Ofcom (2007), 'Future Broadband: Policy Approach to Next Generation Access', September 26th, p. 34, available at http://www.ofcom.org.uk/consult/condocs/nga/future_broadband_nga.pdf.
[4] The more income- and/or price-elastic a firm's product, the higher the systematic risk of that firm. See, for example, Subrahmanyam, M.G. and Thomadakis, S.B. (1980), 'Systematic Risk and the Theory of the Firm',*The Quarterly Journal of Economics*, **94**:3, May, pp. 437–51.
[5] For example, academic studies undertaken with Japanese data seem to suggest that price elasticity of fibre is higher than for other products. See, for example, Ida, T. and Kuroda, T. (2006), 'Discrete Choice Analysis of Demand for Broadband in Japan', *Journal of Regulatory Economics*, **29**:1, pp. 5–22; Ida, T. and Sakahira, K. (2007), 'Discussion Paper no. 120: Broadband Migration and Lock-in Effects: Mixed Logit Model Analysis of Japan's High-speed Internet Access Service', Interfaces of Advanced Economic Analysis, Kyoto University, January.
[6] A parallel could be drawn with the price cap regulation adopted in utilities and utility-like sectors in the UK. Under this regime, the allowed depreciation represents the return *of* capital, while the allowed return represents the return *on* capital.
[7] There is a large body of economic literature discussing the role of regulatory uncertainty. The issues of the periodical regulatory commitment versus the firm's long-term incentives are discussed in, for example, Laffont, J-J. and Tirole, J. (2000), *Competition in Telecommunications*, Cambridge, Massachusetts: The MIT Press, pp. 55–56.
[8] For example, Ofcom recognises that, from an investor's perspective, access terms should reflect the risks at the point in time of the investment for 'much of the life of the asset'; however, under the European Regulatory Framework, it is difficult to make such commitments over a long period of time. Ofcom (2007), 'Future Broadband', September, para 5.18.
[9] It has been emphasised by, among others, the European Competitive Telecommunications Association (ECTA) that risk differentials may be particularly strong in some forms of NGA network investment, but may constitute relatively risk-free renewal of equipment in others (eg, FTTH compared with VDSL). WIK Consult (2008), 'The Economics of Next Generation Access: Final Report', study commissioned by ECTA, September 10th, para 33.
[10] European Commission (2008), op. cit.