

Valuing spectrum in Thailand: what can we learn?

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The 900 MHz and 1800 MHz spectrum auctions in Thailand have generated plenty of headlines over the last few months. These have ranged from the initial astonishment at the spectacular prices to the recriminations that followed after new entrant Jasmine failed to pay the licence fee and thus lost the licence it won. Plum was part of the ITU team which advised the NTBC on the value of the two spectrum bands ahead of the auctions. This Insight revisits the findings of our valuation study in light of the auction outcomes to draw important lessons for the future.

The value of spectrum

Spectrum, the essence of wireless communications, is a finite resource. For mobile operators, spectrum is utilised alongside physical inputs – wireless transmitter sites and equipment – to provide mobile wireless connectivity. Both the amount of radio spectrum and the number and distribution of sites contribute to the coverage of a cellular mobile network and its capacity – the ability to carry a volume of mobile data traffic.

The value of spectrum is a result of the benefits that could be generated from the use of the spectrum, considered to be the most productive use. For a mobile operator, this relates to two main aspects:

- The use of spectrum to reduce cost – the spectrum is used instead of physical network components such as new base stations to support traffic growth. The value here is the reduction in cost, namely, cost savings obtained from using the spectrum¹
- The use of spectrum to generate extra revenue – either through a new service or otherwise to help the company compete effectively in the market and protect its market share and future revenue stream. The value here will therefore relate to the stream of future cash flow for the company.

There is also a third aspect, namely option value, which may be relevant in cases where a spectrum licence is tradeable, renewable or fungible in terms of change in use.² These characteristics confer advantages which may influence a firm's willingness to pay for spectrum.³

In cases where spectrum is auctioned, its value is revealed in the market clearing prices. As observed in the numerous spectrum auctions over the past decade⁴, there is a substantial degree of uncertainty in spectrum prices which reflect the differences in market and operational circumstances, and in operators' strategies and expectations of the future.

Our approach to valuation

Plum was part of the ITU team which advised the Thailand regulator, National Broadcasting and Telecommunications Commission (NTBC) on the reserve prices for the recent auctions of the 900 MHz and 1800 MHz bands.⁵ The crux of the work involved the assessment of the value of these two bands. The following valuation methods⁶ were used:

- Benchmarking approaches which included direct benchmarks using similar bands, adjusted benchmarks based on value ratios and econometric analysis;
- Cost reduction modelling which examined the trade-off between spectrum and base stations inputs to estimate the incremental value of spectrum; and
- Full enterprise valuation which estimated the additional profit attributable to the spectrum using discount cash flow modelling.

Plum modelled two different types of operators (large and small⁷). Large and small operators were modelled as operators with a long-term market share of 35% and 25% respectively. These were derived from a conservative view

¹ Sometimes referred to as the least cost alternative.

² M Cave and W Webb (2015). Spectrum Management.

³ Economic principles suggest that spectrum price is related to its opportunity cost, namely the value of the next best alternative, or the opportunity foregone.

⁴ Plum Insight. Reserve prices in spectrum auctions: why size matters, April 2016.

⁵ The study was carried out and completed in 2014 and Plum subsequently updated the results in 2015.

⁶ For more information on valuation methodologies, see <http://plumconsulting.co.uk/category/spectrum/>

⁷ These were referred to as typical and marginal operators in the study.

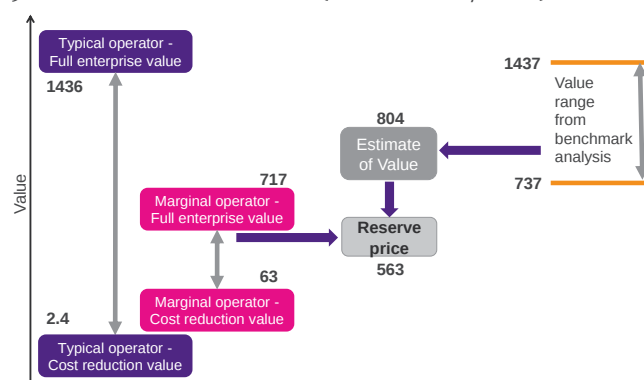
of the growth in future market shares given the actual market shares of the incumbent operators at the end of 2013. The cost-reduction values and full-enterprise values were calculated to give a minimum and maximum for the range respectively.⁸

International benchmarking analysis was then used as a cross check on the modelling results and to constrain the ranges further in order to arrive at value estimates for the two bands. The benchmarking dataset comprised relevant auction results for similar bands from 2006 onwards and narrower samples for Asia Pacific countries and countries with similar socio-economic characteristics to Thailand were also considered.

Valuation results

The valuation results shown below were discussed in the public hearings on the 900 MHz and 1800 MHz spectrum auctions in July and August 2015.

900 MHz valuation results (THB million/MHz)



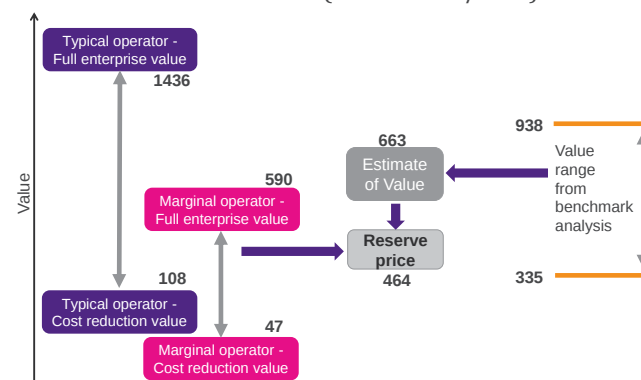
Source: Plum Consulting

The cost-reduction value of the 900 MHz spectrum to a large operator is much lower than its cost-reduction value to a small operator. Cost reduction value is derived from the cost savings achieved from spectrum use. In the case of the 900 MHz band, this stems largely from the ability of the operator to increase coverage substantially without building a large number of sites in rural areas. In the study the typical operator is assumed to already have extensive network coverage on the 2100 MHz band in rural areas with a large number of sites. Hence, the cost-reduction value of 900 MHz to the large operator is very low.

By comparison, the cost reduction value for the 1800 MHz was higher as it was assumed that this band would be

mainly deployed to meet capacity needs in urban areas where mobile traffic demand is high.

1800 MHz valuation results (THB million/MHz)



Source: Plum Consulting

The reserve prices shown above were recommended by Plum as the reserve prices. Following the public hearings, the NBTC adjusted the reserve price per MHz for 900 MHz and 1800 MHz to THB 645 million and THB 530 million respectively. The 1800 MHz auction was held in November 2015 followed by the 900 MHz auction in December 2015.

The outcomes

Both the 900 MHz and 1800 MHz auctions attracted four participants – the three incumbents (AIS, DTAC, True) and a new entrant (Jasmine). With just two lots available in each band⁹ the bidding was highly competitive particularly for the 900 MHz which went to 199 rounds.

The results of the two auctions are shown below. Although Jasmine won one 900 MHz lot, its subsequent failure to pay the licence fee instalment meant that it was not awarded the licence. The spectrum is expected to be re-auctioned in the near future.

Band	Winners	Spectrum won	Winning prices per MHz (THB mn)
900 MHz*	True	2x10 MHz	3,815
1800 MHz	True	2x15 MHz	1,326
	AIS	2x15 MHz	1,366

Note: * Jasmine's winning bid was THB 3,783 million.

The results, particularly for the 900 MHz, were greeted with astonishment among observers who noted the winning prices on per MHz per capita basis were among the highest in the world.¹⁰ Compared to the 2100 MHz auction results in

⁸ The premise is that rational bidders should be willing to pay more than the infrastructure costs saved from having an incremental lot of spectrum, namely the cost reduction value. At the same time, they should also not pay more than the net present value of future cashflows from use of the spectrum, namely the full enterprise value.

⁹ For the 900 MHz band, two lots of 2x10 MHz were offered; for the 1800 MHz, two lots of 2x15 MHz were offered.

¹⁰ Mobile World Live. Thailand's True, Jasmine win 4G licences for record \$4.2B, 21 December 2015.

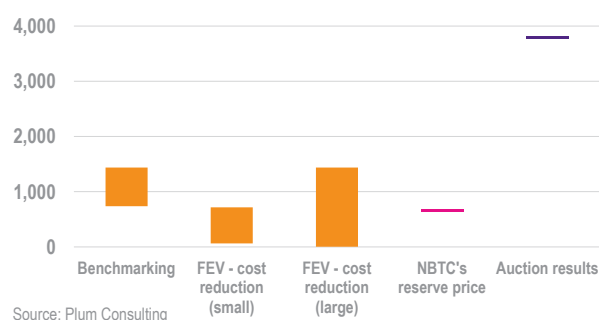
2012¹¹, the 1800 MHz price was more than twice as high while the 900 MHz was almost six times higher.

Why were the values this high?

The winning bids for both bands were well above the reserve prices and exceeded Plum's estimated values. In the case of the 900 MHz they even surpassed the original full enterprise values (FEV) estimated. The auction results per MHz are plotted against the ranges from the NBTC public hearings and the NBTC's reserve prices below.

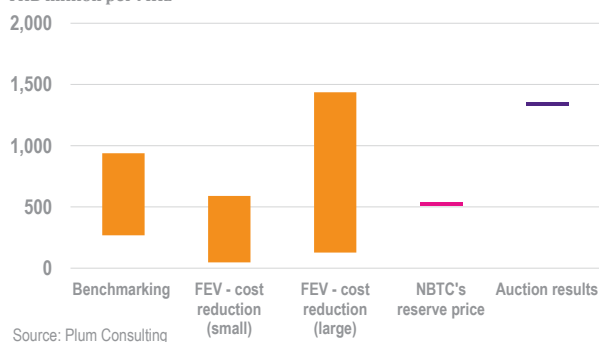
900 MHz ranges and results

THB million per MHz



1800 MHz ranges and results

THB million per MHz



In calculating the full-enterprise value of spectrum, it had been assumed that by the time of the auctions, the operators in Thailand would already have clarity over future releases of the 700 MHz, 2300 MHz and 2600 MHz bands for mobile use. As such, the operators would expect to see contributions to their future revenue streams from these bands and thus attribute proportionate percentages of future earnings to them.

However, the timetable for the release of these bands remains unclear to this day due to potential delays in migrating incumbent users, such as terrestrial broadcasters, out of these bands. This uncertainty in future spectrum supply means that in deciding on their spectrum acquisition,

the operators would place more weight on the 900 MHz and 1800 MHz bands which they have a reasonable expectation of obtaining.

In such a situation, an operator may believe that failure to secure spectrum in the auctions could have a hugely damaging effect on its reputation and brand image and even put its long term survival in the market in question.¹² If this is assumed to be the case, operators may attribute all of their future earnings to the 900 MHz and 1800 MHz bands, and the full enterprise value of the small and large operators for the bands would be:

- Small operator 900 MHz FEV: THB 7.0 billion
- Large operator 900 MHz FEV: THB 3.8 billion
- Small operator 1800 MHz FEV: THB 4.7 billion
- Large operator 1800 MHz FEV: THB 3.5 billion

It can be seen that although the Thai auction results are very high and exceed the original value estimate ranges, they do fall below the FEVs under this new assumption.

What were the main price drivers?

The fact that the auction results far outstrip the market benchmarks in comparable countries suggests that factors specific to the Thailand market are likely to have played a key role in the outcomes observed.

First, there is very limited spectrum that can be assigned readily and very little certainty about the release of new bands which have been globally harmonised for mobile broadband services, such as the 700 MHz and 2600 MHz bands.¹³ Therefore, against the background of rising mobile data consumption¹⁴ established LTE bands with favourable characteristics such as the 900 MHz and 1800 MHz were highly sought after, especially given their complementarity to the incumbent operators' existing holdings. The following chart shows the current spectrum available for mobile in Thailand compared to countries in the EU.

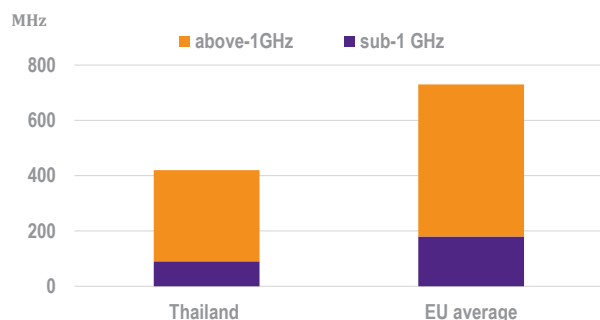
¹¹ The 2100 MHz was won by AIS, DTAC and True at a price per MHz of THB 462.5 million.

¹² The likelihood of long-term damage to an operator's prospects due to failure at an auction is low since the value of a business extends well beyond spectrum ownership. Although an operator is not likely to attribute all its future earnings to the 900 MHz and 1800 MHz spectrum, the specific circumstances in Thailand mean the operators may place more weight on the importance of these two bands.

¹³ In a previous study, Plum had identified a significant "divide" in terms of spectrum assigned for mobile services between countries in ASEAN and South Asia and those in Europe, North America and Asia Pacific. See http://www.plumconsulting.co.uk/pdfs/Plum_Jan2014_harmonised_spectrum_for_mobile_asean_south_asia.pdf

¹⁴ Bangkok Post. 4G mobile subscribers set to skyrocket, 24 December 2015.

Spectrum available for mobile (as of 2016)



Source: Plum Consulting

Second, the auctions were highly competitive as mentioned above. Unlike the 2100 MHz auction in 2012 which featured only the three incumbents, there was a potential new entrant in the form of Jasmine which was determined to try to secure spectrum to break into the mobile market. The threat of increased competition from a fourth operator could have led to the incumbents raising their bids to attempt to foreclose the new player.

What we learnt

The factors discussed above are difficult to account for in calculations of spectrum value. In particular, it is hard to predict how aggressively participants will bid in an auction especially if new players are also taking part in the auction. While incumbent players will have some idea of each other's needs and valuations, a new player's motivations and behaviour would be less obvious and this could complicate the possible scenarios and bidding strategies. Another difficulty stems from sequential auctions, as was the case in Thailand, and assessing the effects of the outcomes of the first auction on subsequent ones.

While cost reduction values can be estimated with reasonable confidence based on available information and the possible scenarios on post-auction spectrum holdings, full enterprise values are more challenging. It is possible in theory to estimate the absolute maximum that a participant will pay in the auction based on the future value of the company although this is contingent on the credibility of the business model that the bidder plans to adopt and the returns that are achievable. This in turn has implications on the ability to finance spectrum acquisitions.

Operators' expectations of the future, in terms of the market environment and operational conditions, change over time and could have a significant impact on the value of spectrum. Capturing these and ensuring that they are reflected in the modelling scenarios are key to achieving robust valuation results.

Conclusions

Spectrum valuation is a challenging task and as the Thailand auctions illustrate, there is no single correct value of spectrum. Not only will value vary by the type of spectrum being sold, it will also vary depending on specific market factors, competitive dynamics, strategic behaviour and future expectations.

There is an unavoidable level of uncertainty when assessing how much a firm will pay for the spectrum as complete information is not possible. That said, the application of robust valuation methodologies discussed in this paper will allow regulators and potential buyers of spectrum to better understand the different aspects of spectrum value and the ranges within which they are likely to fall given a particular set of circumstances.

About Plum

Radio spectrum is increasingly at the centre of strategic decisions for info-communications industries, and Plum provides clients with an unrivalled capability in this field. We offer strategic, policy, regulatory, technical and engineering advice on problems relating to the use of spectrum and to the telecommunications, online and audio-visual media sectors.

We provide consultancy services on all aspects of spectrum policy and regulation, including release of spectrum, spectrum pricing, award design, auction support, licensing frameworks, coordination and coexistence. Our advice is based on economic and technical analysis, which is combined with extensive market knowledge of the communications sectors.

Plum is a London-based partnership and its consultants have worked for regulators, governments and private clients in a wide range of institutional and market environments. In addition to our clients in the UK, we have advised clients in Europe, Asia Pacific, the Americas, the Caribbean, Africa and the Middle East.

To discuss the spectrum valuation advisory services we offer, contact Yi Shen Chan

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