Our energy future

If we build energy supplies, will they come?

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- We think base case projections for long-term growth in energy demand may be too conservative.
- If the energy supply challenge is somehow overcome, demand for all energy resources could soar, particularly in energy-starved regions of the world.
- We believe a diverse array of energy sources is needed well into the future. Hence, we recommend that energy investors maintain a diversified energy portfolio.

In this issue of *Our energy future*, we turn our attention to global energy demand. How might a wider array of affordable energy resources impact future demand? We believe the stage is being set for higher-than-forecast energy demand growth.

In our last issue of *Our energy future, Where's my energy?*, we discussed the difficulty of developing meaningful amounts of new energy supply in a cost-effective and timely manner. While we expect the energy challenge will be ongoing, a more diverse array of energy resources helps to alleviate the effect. Our view is that if we build affordable energy supplies, not only will they come, but they will ask for more.

Our premise for higher-than-projected energy demand growth is as follows:

- Future energy demand growth will be derived from emerging markets, where some have laid out ambitious economic development plans. As such, global energy demand growth will shift further from developed to emerging economies, where GDP and population growth outpaces the developed world.
- Urbanization trends are underway in emerging markets. These coincide with rising per-capita incomes. Newly urbanized people with higher incomes are likely to use more energy (through increased manufacturing and transportation activity, for example). As such, we believe industrial energy demand for future development is underestimated.
- A large portion of the population in developing regions lacks access to even the most basic energy. Sustainable development initiatives sponsored by organizations around the world, calling for access to affordable and reliable energy for all, could substantially increase the size of the global energy market and accelerate rising demand trends.
- Diversification of our energy resource base through renewables could boost quantities of affordable energy supplies. Rather than displace existing demand for non-renewables, we believe they could fuel stronger demand for all resources.

Source: istock

This is the third report in our global energy research series, *Our energy future*, where we hope to answer some of the most pressing questions on the minds of energy investors.

Coming soon in *Our energy future*

- *Global electrification – what will it take?*
- *Transportation fuel fight?*

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The base case for global demand growth

The International Energy Agency (IEA) projects global energy demand growth to slow from an annual pace of 2% thus far this century, to 1% annually through 2040. The agency's base case assumptions are:

- Traditionally, the two key factors widely used to estimate energy demand are global GDP growth and population growth. Historically, these inputs have been fairly reliable predictors of energy demand (see Fig. 1).
- The global population is projected to rise from 7.4 billion in 2016 to 9.1 billion by 2040 (based on United Nations projections). This implies a compound annual population growth rate of 0.9%, down from 1.2% thus far this century (see Fig. 2).
- The IEA assumes a compound annual global GDP growth rate of 3.4% through 2040, down from an average 3.6% thus far this century (assumptions based on International Monetary Fund projections and the World Bank database).
- The IEA notes that future energy demand growth will be derived from non-OECD or emerging economies. In the past, energy demand growth was driven by developed economies. Emerging economies now consume the majority of the world's energy (see Fig. 3). This shift only occurred within the last five years.
- The IEA's model also incorporates other assumptions, including advances in energy efficiency, future energy policies, as well as economic activity and demographic trends beyond the "traditional model." In addition, it incorporates projections on energy price trajectories and the evolution of costs for new energy technologies.

Our case for above-trend demand growth

If we build energy supplies…

It is reasonable to believe that anyone in the world could have energy if they wanted it. Though it may seem counter-intuitive, we believe that one of the largest constraints to global demand is affordable supply. Otherwise, it is difficult to explain why so many regions of the world lack access to energy. A conservative demand growth outlook from the energy agencies seems prudent, given the energy supply challenge.

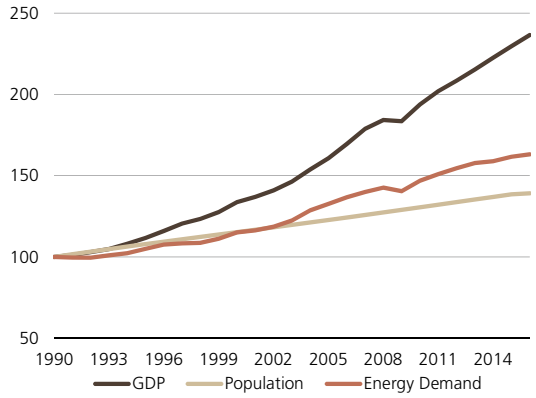
Our argument that energy demand has been constrained by availability in supply centers around the vast regions of the world that have been left behind. Some 1.1 billion people around the world – 15% of the global population, mainly in Africa, India, and other developing nations in Asia – currently lack access to electricity. Even more people, 2.8 billion, lack access to clean cooking facilities, relying instead on collected biomass, coal, or kerosene. Approximately 85% of the world's energy-poor live in remote, low-density rural areas.

…they will come

Picture a world in which energy supplies are widely accessible and affordable. Consider the large underserved energy market in the developing world.

Fig. 1: Population growth and GDP influence global energy demand growth

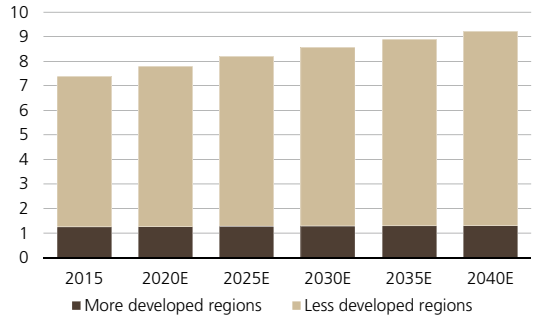
Figures indexed to 100



Sources: Energy Information Administration, United Nations, International Monetary Fund, World Bank, UBS

Fig. 2: Projected population – driven by less developed regions of the world

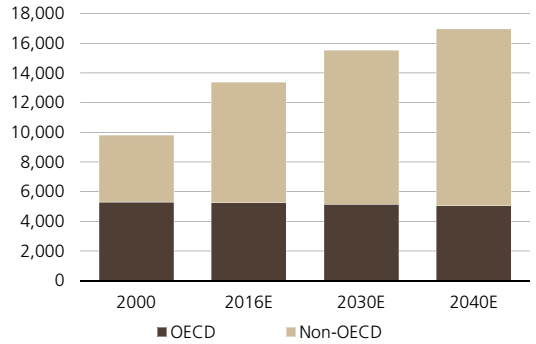
Values are in billions



Source: United Nations Population Division, UBS, as of 13 February 2018

Fig. 3: Emerging economies now consume the majority of the world's energy

The shift only occurred this decade; values are in million tons of oil equivalent



Source: International Energy Agency, UBS, as of 13 February 2018

Note: The OECD (Organization for Economic Cooperation and Development) is composed mostly of nations with developed economies.

The IEA's projections suggest a period of elevated GDP and population growth in certain emerging economies, including India and Africa (see Fig. 4). This lays the foundation for a burgeoning middle class around the world, supporting the transition from energy-poor to a modern lifestyle afforded by access to energy. We believe this is already underway in areas of China and India, where energy demand growth has been strong over the past several years.

Supportive tailwinds for a higher demand scenario

The probability that energy demand materializes in the world's underserved markets is enhanced by various global initiatives. For instance, under the Paris Agreement of November 2016, countries affirmed their intentions to ensure universal energy access by 2030. Working within the UN's Sustainable Development Goals framework, public and private institutions target access to affordable, reliable, sustainable, and modern energy for all; reduction of air pollution; and combating climate change (please see text box on right for further reading on UBS's commitment to help achieve global Sustainable Development Goals).

With a demographic shift from developed to emerging economies as the main drivers of energy demand growth, population growth could play a more influential role than in the past. The projected increase in the global population will be greatest in the least-developed countries within Africa and Asia, including India. Populations of more developed nations will grow at a comparatively slow pace, according to the UN World Population Prospects.

Likewise, global GDP growth will also be driven by emerging economies. China is projected to be the largest contributor of gross domestic product (GDP) gains. India is also growing strongly with its share of global GDP projected to double by 2040. Together, China and India currently account for about 37% of the global population, but only 28% of current energy demand. For comparison, the US accounts for about 4% of the global population and 16% of global energy demand.

We believe the IEA's outlook for the pace of energy demand growth may be too low, particularly in the 2016–2025 timeframe (see Fig. 5). Our view is further supported by the projected pace of urbanization in the developing world, which in the recent past has supported very strong industrial energy demand.

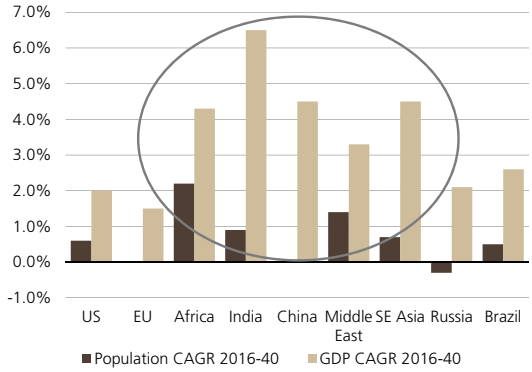
Urban living is energy-efficient, but…

Urbanization is a trend well underway, and is most evident in China and India. Not coincidentally, energy demand growth has been most prominent in these regions. In the future, Africa will see meaningful acceleration of these urbanization trends.

In its future projections, the International Energy Agency cites a process of urbanization that adds a city the size of Shanghai to the world's urban population every four months. These cities will be smart and energy-efficient, and very large. This is a key force underpinning its future demand projections, but we believe the agency may be under-estimating the energy that will be required to establish these urban centers.

Fig. 4: Population and GDP growth rates – stronger in emerging and developing regions

Figures are annualized growth rates in percent



Source: International Energy Agency, UBS, as of 13 February 2018

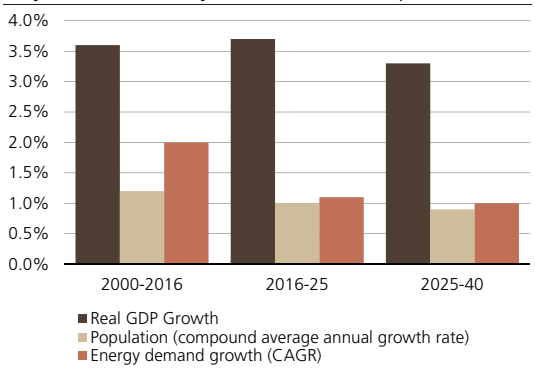
For further reading on UBS's support of global sustainable development, please see:

Partnerships for the goals
Achieving the United Nations' Sustainable Development Goals
January 2018

The United Nations' Sustainable Development Goals (SDGs) provide a roadmap to solve our common sustainability challenges and the seventeenth SDG is Partnerships for the Goals. In this white paper, UBS explores how specific types of partnerships can achieve the SDGs. It also invites others to join in creating a more sustainable world together.

Fig. 5: Projected growth in population, GDP, and energy demand

Future energy demand seems understated, particularly in the next 10 years; CAGR are in percent



Source: International Energy Agency, UBS, as of 13 February 2018

Note: CAGR=compound annual growth rate

…a modern lifestyle needs energy to support it

Urbanization will help drive a more energy-efficient world, enabling a lower rate of growth in overall per capita energy consumption due to economies of scale and energy-efficient building technologies. But building and expanding modern cities means construction of office buildings and apartment buildings and infrastructure, requiring heavy machinery and materials manufacturing. What's more, urban development is projected to continue on a very large scale at least through 2030 (see Fig. 6).

Recall China's strong growth in energy demand last decade as cities such as Shanghai were built and modernized. This was a primary contributor to strained global energy supplies last decade, when we saw oil prices surge above USD 140 per barrel.

China's energy demand accounted for 11% of the world's total in 2000. By 2016, China was the largest energy consumer in the world, devouring approximately 23% of the world's energy (see Fig. 7).

Longer term, servicing modern cities means more long-distance transport of goods by air, rail, and trucks. With proper planning, urbanization will drive a higher quality of life for much of the global population. Supporting a modern lifestyle for this large population, supporting businesses that provide jobs for the cities' residents, maintaining a modern city's infrastructure, and keeping pace with ongoing growth will require lots of energy from all sources, in our view.

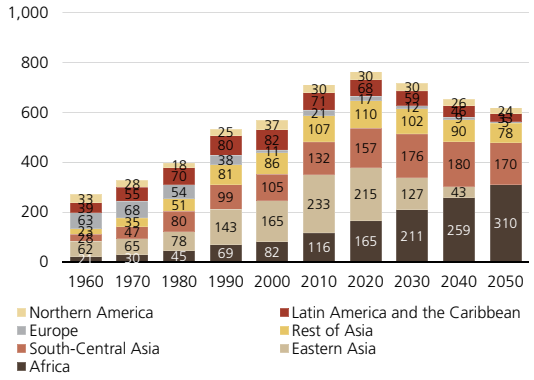
China and India: ambitious plans for the future

Economic plans and energy policy recently announced in China and India have been incorporated into the International Energy Agency's outlook. While their energy policies are thoughtfully focused on a clean and sustainable energy future, realistically, the countries' economic growth plans appear energy-intensive.

Facing severe environmental problems, China's government has rolled out a new energy policy focused on reduced use of coal, increasing energy efficiency, and on restructuring its economy. The pace of China's energy transition will impact the global energy markets. China produces nearly 90% of the coal it consumes. Substitutes, particularly natural gas, may need to be imported. Over time, China plans to develop its large shale gas resources, some of them located in remote areas of the country. This alone will be an energy-intensive process, given the equipment and infrastructure this would require. While China's coal consumption will fall, the IEA projects demand for energy ex-coal will rise at an average annual pace of 4% through 2025 before slowing to 2.1% in 2025 through 2040 (see Fig. 8).

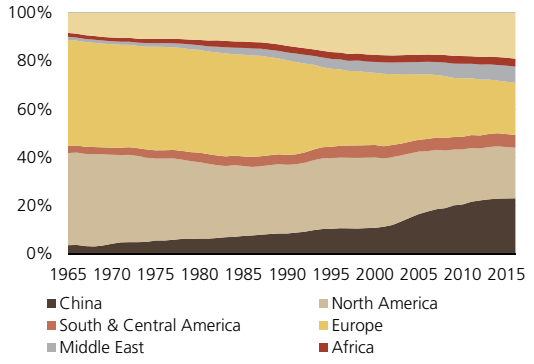
India, where both population growth and GDP growth are projected to exceed the world average through 2025, is expected to be the next region of pronounced development. Today, while India's population is about equal in size to that of China, India's energy consumption accounts for just 7% of global energy demand.

Fig. 6: Number of people that will be newly urbanized globally by region/sub-region (e.g., 2020 refers to the time span from 2010 to 2020)
Values are in million people



Source: UN, UBS, as of 13 February 2018

Fig. 7: China's primary energy consumption as percent of global total
China's demand share has risen from 3.5% in 1965 to 23% in 2016



Source: BP, UBS

Energy goals

China

China's energy goals focus on reduction of coal consumption. China is by far the largest coal consumer in the world, and coal comprises over 65% of its energy consumption. As part of its "energy revolution", China looks to transition away from coal, which will boost its consumption of natural gas and renewables.

India

India's government released a proposed energy policy with targets that include electrification (universal "24x7 access for all by 2022); a higher share of manufacturing in GDP; a reduction in oil imports; for 175 gigawatts (GW) of renewable power generation capacity by 2022; and to reduce the emissions intensity of the economy by 33-35% by 2030 (from the 2005 baseline) by boosting the share of non-fossil-fuel capacity in the power sector to 40%.

In addition to an expanding population, the Indian government aspires to more than double the size of its economy to USD 5 trillion by 2025. While ambitious, the country's economy has bloomed to over USD 2 trillion, from under USD 500 billion in 2000. Yet, in 2025, the International Energy Agency estimates that India will consume just 8% of global energy. By 2040, the IEA projects India's economy to approach the size of China's today, and its population is expected to exceed China's by over 200 million people (about 70% of the US's current population of 328 million). Yet India is projected to consume about 50% of the energy consumed in China in 2040, and about 63% of what China consumes today (see Fig. 9).

Africa hardly enters into the discussion on global energy demand. The entire continent consumes only about 6% of the world's energy today. Africa's population, much of which is among the world's most energy-poor, comprises 16% of the global total. Africa's population is expected to rise at a rapid pace, to 23% of the world's population by 2040. Urbanization will be a key theme in Africa, and many sustainable-development programs will be focused on increasing access to energy in the continent. If successful, Africa's future energy demand growth could be enormous. For now, the IEA forecasts 2% annual growth in Africa's energy demand through 2040, about 62% the pace of demand growth projected in India.

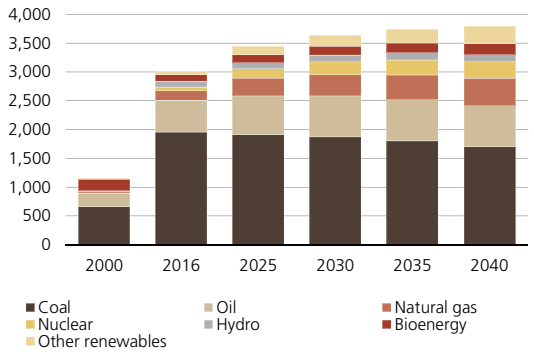
While it is true that energy efficiency gains could alter the pace of future energy demand growth in certain sectors (i.e., power, light duty vehicle transportation fuels), we have seen less progress on energy efficiency in the industrial sector. If economic development and urbanization trends materialize in the developing world, we see industrial demand as a potentially large source of the "upside demand surprise" through 2025. Energy intensity is likely to rise with industrial activity (see Fig. 10).

Investment conclusions

It is difficult to predict precisely how our energy future will evolve. The factors that are typically used in predictive models point to ongoing global energy demand growth. However, from a supply perspective, our energy future is brightening with a growing and more diverse array of viable energy sources. We contend that this could significantly impact demand trends. Assuming more affordable energy supplies are delivered, we believe future energy demand growth trends could accelerate significantly.

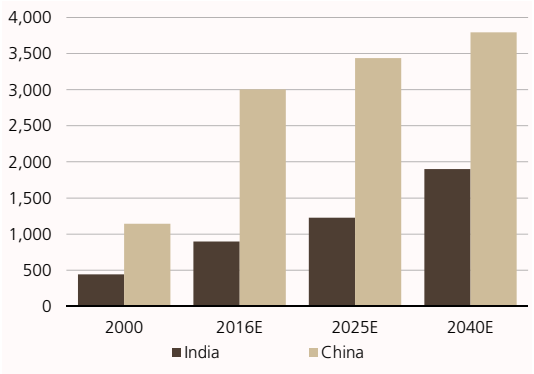
Renewable fuels will play a central role in shaping our energy future. Growth in renewable energy supplies will enable governments to achieve their social and environmental goals. But as the large, currently underserved energy market develops, we envision higher demand for energy from all resources. We would maintain a diversified energy portfolio.

Fig. 8: Chinese energy demand projections
While coal demand falls, demand for other energy resources rises. Energy efficiency gains will likely slow the pace of growth. Values are in million tons of oil equivalent.



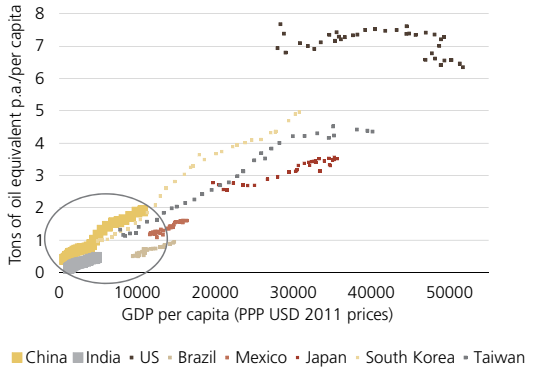
Source: International Energy Agency, UBS, as of 13 February 2018

Fig. 9: India and China energy demand projections
In million tons of oil equivalent



Source: International Energy Agency, UBS, as of 13 February 2018

Fig. 10: Energy consumption relative to GDP per capita
Energy (crude oil, coal, and natural gas)



Source: BP, International Monetary Fund, UBS, as of 13 February 2018

Note: 1 ton of oil equivalent equals to around 7.33 barrels of crude oil

Appendix

Terms and Abbreviations

Term / Abbreviation	Description / Definition	Term / Abbreviation	Description / Definition
1H, 2H, etc. or 1H11, 2H11, etc.	First half, second half, etc. or first half 2011, second half 2011, etc.	1Q, 2Q, etc. or 1Q11, 2Q11, etc.	First quarter, second quarter, etc. or first quarter 2011, second quarter 2011, etc.
2011E, 2012E, etc.	2011 estimate, 2012 estimate, etc.	A	actual i.e. 2010A
ADR	American depositary receipt	ARPU	Average Revenue Per User
AUM	Assets under management = total value of own and third-party assets managed	Avg.	average
bn	Billion	bp or bps	Basis point or basis points (100 bps = 1 percentage point)
BVPS	Book value per share = shareholders' equity divided by the number of shares	CAGR	Compound annual growth rate
Cant Inc/Capita	Cantonal income per capita (Switzerland only)	Capex	Capital expenditures
CF	Cash flow	CFO	1) Cash flow from operations, 2) Chief financial officer
Cons.	Consensus	Core Tier 1 Ratio	Tier 1 capital minus tier 1 hybrid securities
Cost/Inc Ratio (%)	Costs as a percentage of income	CPI	Consumer price index
CR	Combined ratio = ratio of claims and expenses as a percentage of premiums (for insurance companies)	CY	Calendar year
DCF	Discounted cash flow	DDM	Dividend discount model
Dividend Yield (%)	Dividend per share divided by price per share	DPS	Dividend per share
E	expected i.e. 2011E	EBIT	Earnings before interest and taxes
EBIT Margin (%)	EBIT divided by revenues	EBITDA	Earnings before interest, taxes, depreciation and amortization
EBITDA Margin (%)	EBITDA divided by revenues	EBITDA/Net Interest	EBITDA divided by net interest expense
EBITDAR	Earnings before interest, taxes, depreciation, amortization and rental expense	EFVR	Estimated fair value range
EmV	Embedded value = net asset value + present value of forecasted future profits (for life insurers)	EPS	Earnings per share
Equity Ratio (%)	Shareholders' equity divided by total assets	EV	Enterprise value = market value of equity, preferred equity, outstanding net debt and minorities
FCF	Free cash flow = cash a company generates above outlays required to maintain/expand its asset base	FCF Yield (%)	Free cash flow divided by market capitalization
FFO	Funds from operations	FY	Fiscal year / financial year
GDP	Gross domestic product	Gross Margin (%)	Gross profit divided by revenues
H	half year	h/h	Half-year over half-year; half on half
hist av.	Historical average	Interbank Ratio	Interbank deposits due from banks divided by interbank deposits due to banks
Interest Coverage	Ratio that expresses the number of times interest expenses are covered by earnings	Interest exp	Interest expense
ISIN	International securities identification number	K	One thousand
LLP/Net Int Inc (%)	Loan loss provisions divided by net interest income	LLR/Gross Loans (%)	Loan loss reserves divided by gross loans
LPR	Least Preferred: The stock is expected to both underperform the relevant benchmark and depreciate in absolute terms.	Market cap	Number of all shares of a company (at the end of the quarter) times closing price
m/m	Month-over-month; month on month	mn or m	Million
M and A	Merger and Acquisition	MP	Marketperform: The stocks expected performance is in line with the sector benchmark
MPR	Most Preferred: The stock is expected to both outperform the relevant benchmark and appreciate in absolute terms.	n.a.	Not available or not applicable
NAV	Net asset value	Net Debt	Short- and long-term interest-bearing debt minus cash and cash equivalents
Net DPS	Net dividends per share	NIM or Net Int Margin (%)	Net interest income divided by average interest-bearing assets
Net Margin (%)	Net income dividend by revenues	NV	Neutral View: The stock is expected to neither outperform nor underperform the relevant benchmark nor significantly appreciate or depreciate in absolute terms.
n.m. or NM	Not meaningful	NPL	Non-performing loans

Appendix

Term / Abbreviation	Description / Definition	Term / Abbreviation	Description / Definition
OP	Outperform: The stocks is expected to outperform the sector benchmark	Op Margin (%)	Operating income divided by revenues
p.a.	Per annum (per year)	P/BV	Price to book value
P/E or PE	Price to earnings / Price Earnings Ratio	P/E Relative	P/E relative to the market
P/EmV	Price to embedded value	PEG Ratio	P/E ratio divided by earnings growth
PPI	Producer price index	Prim Bal/Cur Rev (%)	Primary balance divided by current revenue (total revenue minus capital revenue)
Profit Margin (%)	Net income divided by revenues	q/q or QQQ	Quarter-over-quarter; quarter on quarter
R and D	Research and development	ROA (%)	Return on assets
ROAE (%)	Return on average equity	ROCE (%)	Return on capital employed = EBIT divided by difference between total assets & current liabilities
ROE (%)	Return on equity	ROIC (%) or ROI	Return on invested capital
Shares o/s	Shares outstanding	Solvency Ratio (%)	Ratio of shareholders' equity to net premiums written (for insurance companies)
sotp or SOTP	Sum of the parts	Tax Burden Index	Swiss tax index; 100 = average tax burden of all cantons
tgt	Target	Tier 1 Ratio (%)	Tier 1 capital divided by risk-weighted assets; describes a bank's capital adequacy
tn	Trillion	UP	Underperform: The stock is expected to underperform the sector benchmark
Valor	Swiss company identifier	WACC	Weighted average cost of capital
CIO	UBS WM Chief Investment Office	x	multiple / multiplicator
y/y or YOY	Year-over-year; year on year	yr	Year
YTD	Year-to-date		