

China Construction

UBS Evidence Lab: what is the market missing in highway investment opportunities?

Equities

China
Industrial

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Potential policy support for infrastructure spending

We expect Chinese construction companies to benefit from potential policy support for infrastructure spending, eg, public-private partnership (PPP) projects. Dr Tao Wang (UBS Chief China Economist) forecasts over a 0.5ppt negative impact to China's GDP from the planned additional 10% tariffs on US\$200bn of Chinese exports to the US. We also expect the Chinese government to ease its credit/quasi-fiscal tightening efforts to stabilise credit growth and infrastructure investment. We partnered with UBS Evidence Lab to gauge the upside potential in railway investment and likely opportunities from highway expansion. Refer to [UBS Evidence Lab: how significant is the high-speed railway network effect?](#) (3 July 2018) for our anti-consensus view that China's railway fixed-asset investment (FAI) could return to Rmb800bn in 2020E.

Market overlooks significant upside potential from highway expansion

UBS Evidence Lab analysed large geospatial datasets of China's full street network, covering over 5m km of public roads. Together with our highway congestion analysis, this leads to our anti-consensus view that China's highway FAI could continue to grow, due to significant demand for lane expansion (eg, from four-lane to eight-lane). Our sensitivity analysis shows that highway lane expansion is likely to require Rmb0.5-1.5trn of investment (24-71% of 2017 highway FAI) till 2025E. However, the market expects highway FAI to retreat in the next few years, given fewer new highways planned under the Ministry of Transport's highway network plan.

PPP to support highway investment

Industry experts we talked to all indicated that highway projects are the most popular projects for PPP, as they generate solid cash flow at mature stages, limiting the government's financial burden. In the Ministry of Finance's (MoF) project database, we find Rmb755bn of highway PPP projects, or 27.3% of all PPP demonstration projects, accounting for 16.3% of the PPP total. In addition, we believe there is upside potential if restrictions on local governments' PPP investment are loosened.

Major beneficiaries: CRCC, CRG and Sany

China Railway Construction (CRCC) and China Railway Group (CRG) are our preferred Chinese construction companies, not only because they dominate China's railway construction market, but also given their significant new highway contracts. Sany Heavy is our most preferred construction machinery manufacturer.

Stocks related to highway construction

Company	Code	Mkt cap (US\$ bn)	Rating	PT (LC)	Price (LC)	PE (x)		P/BV (x)		Div. yld (%)		ROE (%)		EPS growth (%)	
						2018E	2019E	2018E	2019E	2018E	2019E	2018E	2019E	2018E	2019E
CRCC	1186.HK	19.1	Buy	13.60	9.22	5.8	5.2	0.7	0.6	2.6	3.1	11.4	12.0	18%	10%
CRG	0390.HK	24.0	Buy	8.30	6.70	7.3	6.6	0.8	0.8	2.3	2.6	11.6	12.0	14%	14%
CCCC	1800.HK	27.4	Buy	12.80	8.55	5.9	5.4	0.6	0.6	3.0	3.4	10.4	10.7	21%	12%
CSCEI	3311.HK	6.3	Buy	13.40	9.77	7.6	6.5	1.1	0.9	4.2	4.8	14.5	15.2	16%	17%
CMEC	1829.HK	2.2	Buy	6.40	4.11	5.4	5.3	0.8	0.8	5.7	7.1	15.6	15.3	3%	7%
CAMCE	002051.SZ	2.6	Sell	13.70	15.62	13.3	13.7	1.9	1.7	1.6	1.9	15.0	13.3	-29%	-3%
Sany	600031.SS	10.1	Buy	11.30	8.96	15.5	12.8	2.4	2.2	4.2	5.1	16.4	18.0	92.7	20.8
Hengli	601100.SS	3.1	Buy	26.16	24.22	30.1	23.3	4.8	4.3	1.7	2.1	17.1	19.4	95.8	29.1
XCMG	000425.SZ	4.3	Buy	5.32	4.19	15.8	13.2	1.1	1.1	1.6	1.9	7.5	8.4	126.5	19.9
Lonking	3339.HK	2.0	Neutral	4.04	3.62	9.3	9.0	1.6	1.4	5.2	5.6	17.1	16.6	37.4	7.2
Zoomlion-A	000157.SZ	4.5	Neutral	4.34	4.17	24.0	19.7	0.9	0.9	3.3	4.1	3.6	4.4	NM	22.2
Zoomlion-H	1157.HK	4.5	Sell	2.89	3.22	15.5	13.1	0.6	0.6	5.0	6.1	3.6	4.4	NM	22.2

Above data as at the close of 27 July 2018. Source: Wind, UBS-S estimates

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China Construction

UBS Research THESIS MAP a guide to our thinking and what's where in this report

MOST FAVORED

CRCC, CRG, Sany, Hengli

LEAST FAVORED

CAMCE, Zoomlion-H

PIVOTAL QUESTIONS

Q: Will PPP drive significant infrastructure investment in China?

Yes. We expect more infrastructure projects (especially highways) to be financed via the PPP model. This should help alleviate the heavy investment burden historically borne by local governments. Also, construction companies generate higher gross margins from PPP projects than cash construction.

[more →](#)

Q: Will overseas projects lead to margin expansion?

Yes. Overseas projects normally carry higher gross margins than similar domestic projects, and they require less working capital. The involvement of the Chinese government and renminbi depreciation against the US dollar should help mitigate potential execution and forex risks.

["Can overseas markets generate GPM 3-5ppt above the domestic segment as guided by management?" 4/21/2017 →](#)

Q: Would consolidation drive efficiency gains?

Yes. We think consolidation among construction companies could increase their focus on core infrastructure businesses, enable more efficient use of resources and reduce competition, encouraging cost-savings.

["Positive on rail FAI in 13th FYP; overseas underappreciated" 4/12/2015 →](#)

UBS VIEW

Anti-consensus view on railway/highway FAI. We view Chinese construction companies as the biggest beneficiaries of potential railway/highway investment upside. We expect railway FAI to return to Rmb800bn in 2020 and believe there are significant investment opportunities in highway expansion.

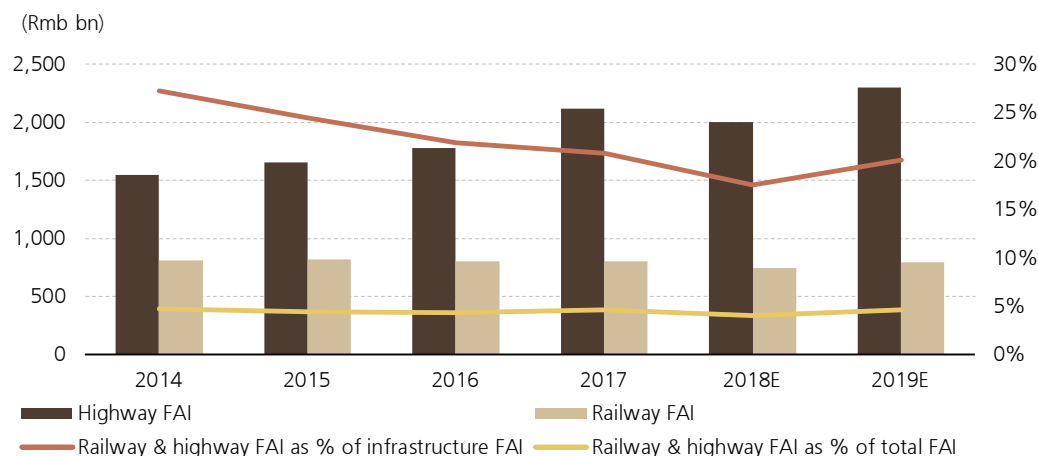
EVIDENCE

Bottom-up analysis of railway and highway projects. We partnered with UBS Evidence Lab to identify potential highway expansion demand by analysing over 5m km of public roads in China.

WHAT'S PRICED IN?

Market pricing in significant domestic FAI deceleration and overseas risks. PE multiples are at multi-year lows, indicating market concerns about FAI growth deceleration and overseas project execution/FX risks.

Highway and railway as two major FAI contributors



Source: National Bureau of Statistics (NBS), China Railway Corporation, Ministry of Transport, UBS-S estimates

We would like to thank Katharine Jiang and Kayla Cai for their assistance in preparing this research report.

PIVOTAL QUESTIONS

[return](#) ↑**Q: Will PPP drive significant infrastructure investment in China?****UBS VIEW**

Yes. We expect more infrastructure projects (especially highways) to be financed via the PPP model. This should help alleviate the heavy investment burden historically borne by local governments. Also, construction companies generate higher gross margins from PPP projects than cash construction.

EVIDENCE

We partnered with UBS Evidence Lab to identify potential highway expansion demand by analysing over 5m km of public roads in China. Our proprietary analysis of 400-plus railway projects suggests railway FAI could recover in 2019/20E.

WHAT'S PRICED IN?

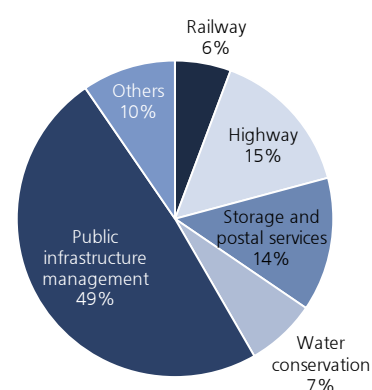
PE multiples are at multi-year lows, indicating market concerns about FAI growth deceleration, following the government's tightening measures on PPP.

Potential upside in railway/highway investment

Infrastructure has been a major FAI contributor in the past, and its share of total FAI has increased in recent years, to 22% in 2017. Within infrastructure, we view highway and railway as two important contributors, representing 6% and 15% of China's infrastructure FAI, respectively, in 2017.

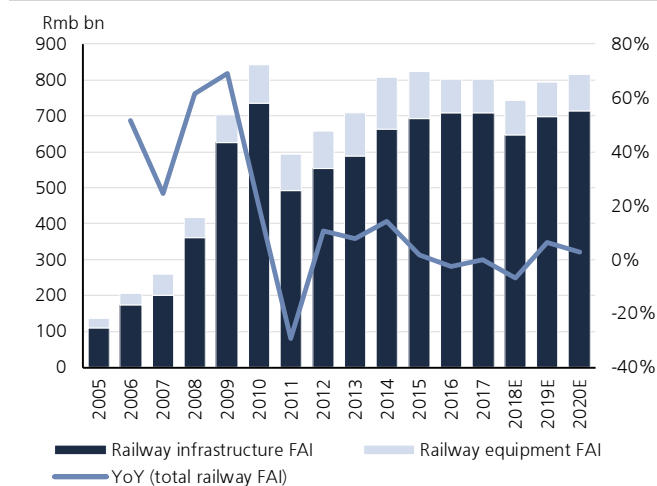
We hold an anti-consensus view that railway FAI is likely to exceed Rmb800bn in 2020, with support from more private investment, active provincial government participation and improving financial situations of China Railway Corporation (CRC). For details, refer to [UBS Evidence Lab: how significant is the high-speed railway network effect?](#) (3 July 2018). The State Council's three-year action plan to improve air quality reinforces our positive view about a comprehensive railway network build-out in China (refer to [In China's three-year action plan for cleaner air, who will benefit and who won't?](#), 11 July 2018).

We also believe there is potential upside in highway FAI (Rmb2.1trn in 2017, accounting for 15% and 3% of infrastructure and overall FAI, respectively), leveraging UBS Evidence Lab's analysis of around 5m km of roads in China. We forecast highway FAI to deliver an 8% three-year CAGR during 2018-20.

Figure 1: Infrastructure breakdown

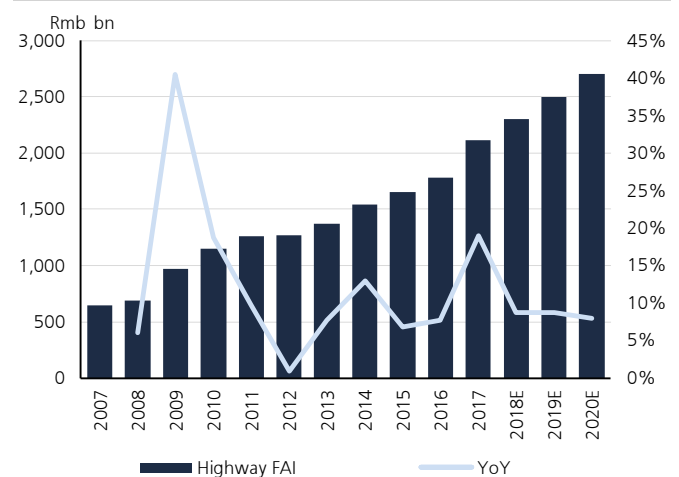
Note: Infrastructure includes transport, storage, postal services, telecommunications, broadcasting, internet, water conservation, environmental protection, and public infrastructure management.
Source: NBS, Ministry of Transport

Figure 2: Railway FAI



Source: China Railway Corporation, UBS-S estimates

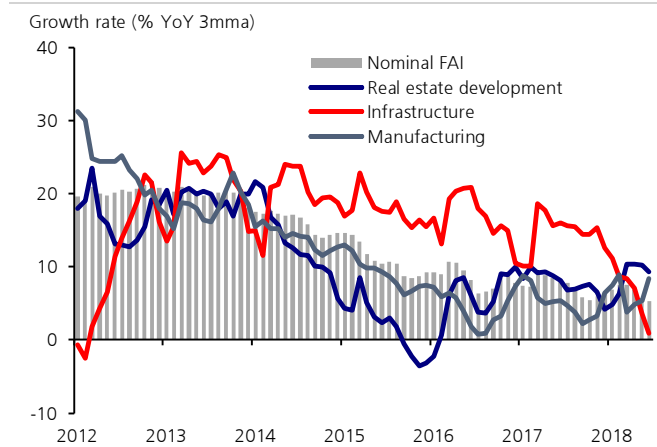
Figure 3: Highway FAI



Source: Ministry of Transport, UBS-S estimates

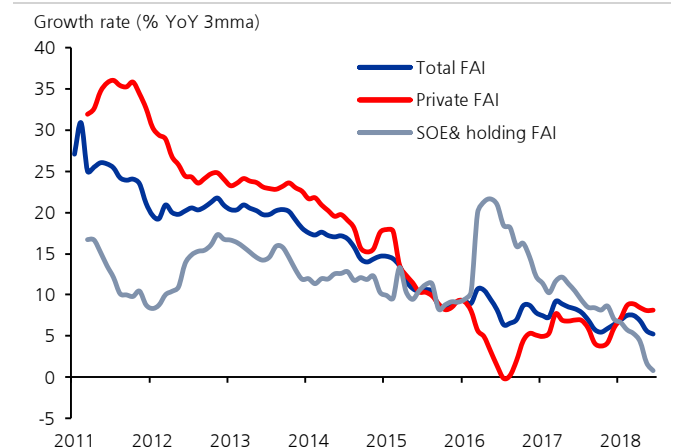
China's economic growth momentum cooled in Q218, largely due to ongoing deleveraging efforts. As shadow credit channels were tightened, local government financing restricted, credit growth moderated and infrastructure investment slowed sharply. However, with the escalation of US-China trade tensions, we expect the Chinese government to adjust its domestic policies by easing its credit/quasi-fiscal tightening efforts to boost infrastructure FAI.

Figure 4: National FAI by sector



Source: CEIC, UBS estimates

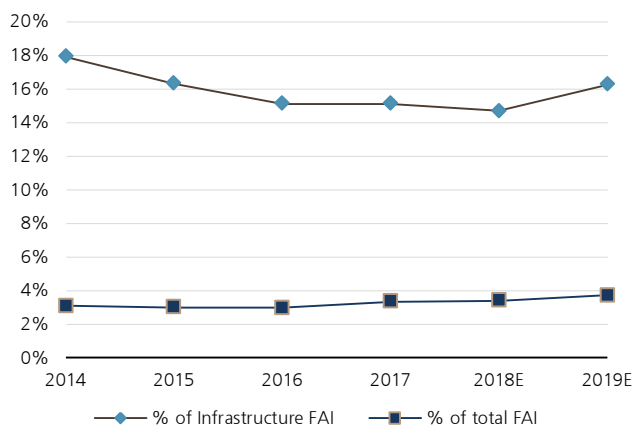
Figure 5: National FAI by type of companies



Source: CEIC, UBS estimates

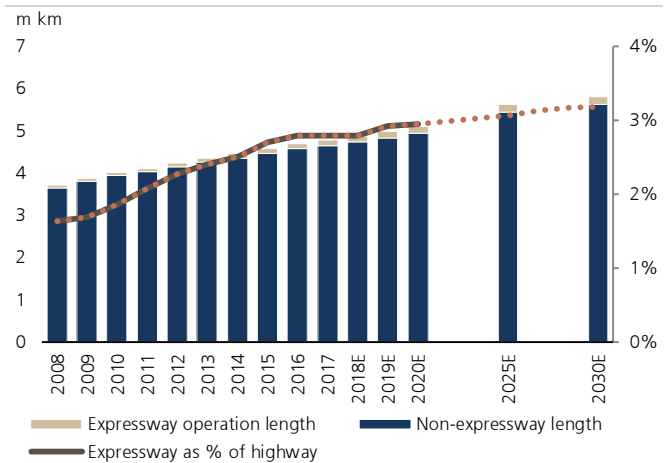
Highway has been a major FAI contributor over the past few years, and we expect its contribution to overall FAI to increase moderately in the next few years, due to more highways to be built and potential investment in highway expansion. According to the Ministry of Transport's 13th Five-Year Plan for transportation, the Chinese government is committed to having 5m km of highways and 0.15m km of expressways by 2020. By the end of 2030, the country aims to have 5.8m km of highways and 0.18m km of expressways, as emphasised in its 2013-2030 National Highway Network Plan. China delivered a total highway length CAGR of 2.4% over the past five years, and the Chinese government expects a 2.7% CAGR for 2020-30. The government forecasts the total length of expressways to increase at a 4.2% CAGR during the same period, albeit at a slightly slower pace than in previous years.

Figure 6: Highway has been a major FAI contributor



Source: Ministry of Transport, UBS-S estimates

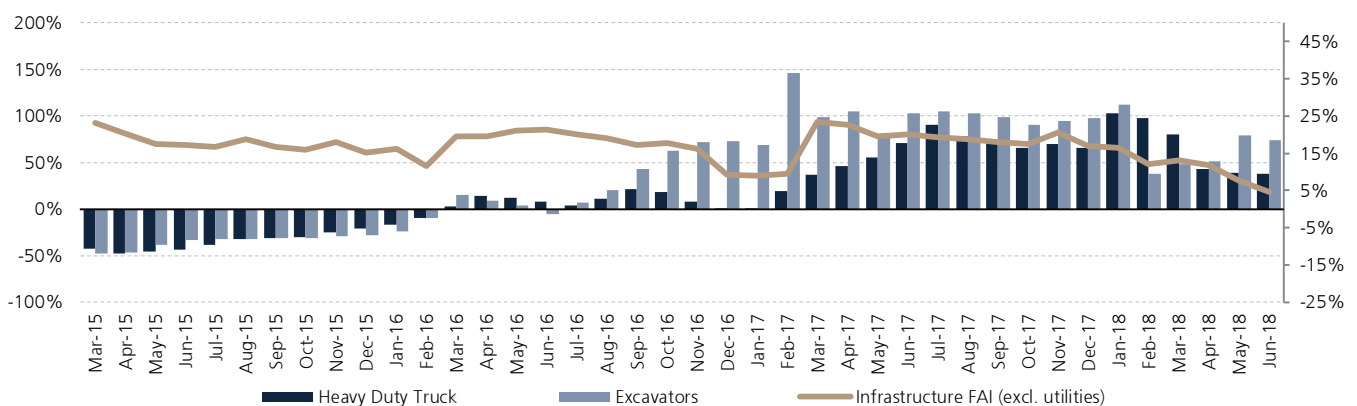
Figure 7: Highway operating length



Source: Ministry of Transport, UBS-S estimates

As shown in the chart below, there is positive correlation between infrastructure FAI growth and sales growth of excavators and heavy-duty trucks, all of which reflect actual construction activities.

Figure 8: Infrastructure FAI vs construction machinery sales growth vs heavy-duty trucks sales growth, 3mma YoY



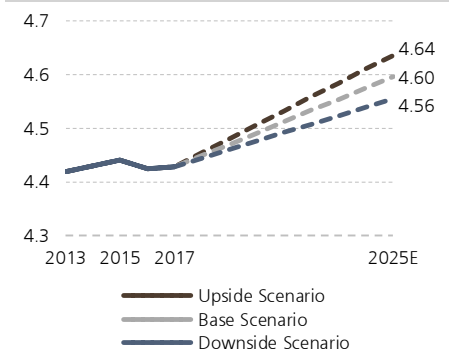
Source: Ministry of Transport, CCMA, CAAM

Gauging potential upside in highway FAI

We partnered with UBS Evidence Lab and analysed close to 5m km of roads in China. Our analysis shows that only 17,553km of roads are 8-lane highways (among Functional Class 1 and 2 highways; refer to UBS Evidence Lab methodology for detailed definitions), representing a mere 4% of the 453,018km of Functional Class 1-2 highways in China.

We expect significant investment upside from potential expansion of mature/congested highways. Extension of concession rights should also provide an incentive for current operators to expand their toll roads. Jinan-Qingdao Expressway is a recent successful example, and the concession expiry was extended from 2029 to 2044, or another 25 years, after the completion of the expansion work. According to the Ministry of Transport, the average lane number of highways remained at around 4.4 during 2013-17. We expect this ratio to increase to 4.60 in 2025.

Figure 9: Average lane number



Source: Ministry of Transport, UBS-S estimates

Quantifying investment demand in highway expansion

Our sensitivity analysis, based on the unit cost of expansion and demand for 8-lane highways, suggests that potential highway expansion investment requires Rmb0.5-1.5trn investment (24-71% of China's 2017 highway FAI) till 2025E.

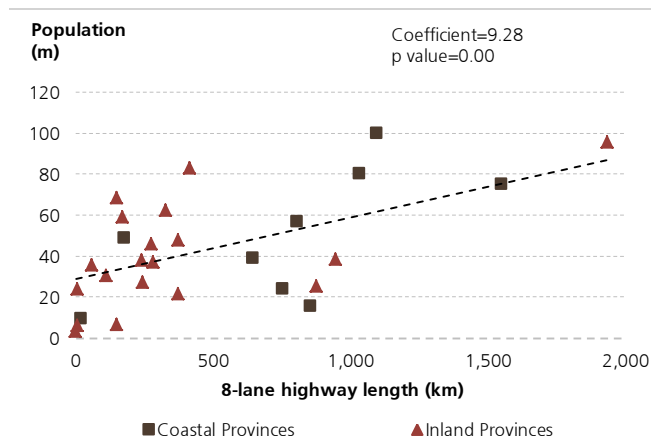
Figure 10: Sensitivity analysis of expansion cost

		8-lane increase (km)						
		6,000	7,000	8,000	9,000	10,000	11,000	12,000
Cost/lane*km (m)	22	528	616	704	792	880	968	1,056
	24	576	672	768	864	960	1,056	1,152
	26	624	728	832	936	1,040	1,144	1,248
	28	672	784	896	1,008	1,120	1,232	1,344
	30	720	840	960	1,080	1,200	1,320	1,440
	32	768	896	1,024	1,152	1,280	1,408	1,536

Source: UBS-S estimates

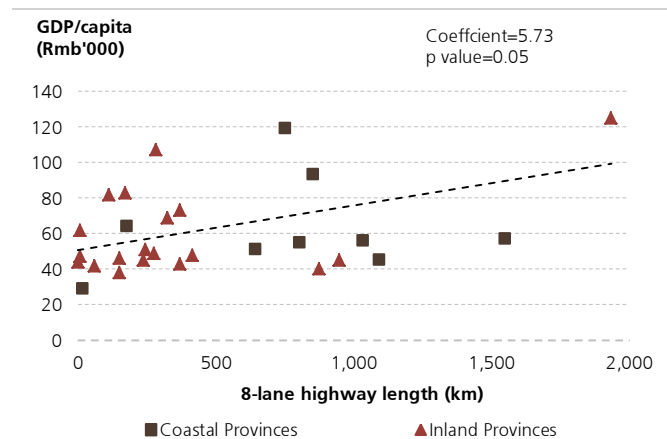
We derive the length of 2-lane, 4-lane, 6-lane and 8-lane highways in all the provinces in China leveraging UBS Evidence Lab data. We find that the 8-lane highway length is highly correlated with population and GDP/capita. With the help of UBS Evidence Lab's data science team, we estimate that every 1m increase in the population leads to 9.3 km of new 8-lane highways, and every Rmb1,000 increase in GDP/capita drives a length increase of 5.7km.

Figure 11: Scatter plot of 8-lane length vs population



Note: Coastal or inland is added as a control variable. Three outliers are eliminated.
Source: UBS Evidence Lab, UBS-S estimates

Figure 12: Scatter plot of 8-lane length vs GDP/capita



Note: Coastal or inland is added as a control variable. Three outliers are eliminated.
Source: UBS-S estimates (no Evidence Lab?)

According to our estimates, by the end of 2025, China's total 8-lane highway length could be 26,440km, indicating an 8,887km increase. And if we consider a further 10% expansion in the most congested provinces according to our congestion map, the total increase would be 9,255km. This is based on the assumption that 8-lane highways should be longer in provinces with higher population and stronger economies (measured by GDP/capita). We also apply benchmarks of 8-lane length/capita and 8-lane length/GDP/capita for each province, using the current averages of those provinces with the nearest higher levels. We assume that by the end of 2025, 8-lane length/capita and 8-lane length/GDP/capita in each province could reach their benchmarks.

Figure 13: Estimated 8-lane increases for all provinces in China

Province	8-lane total (km)	8-lane length/capita (km)	Target 8-lane length/capita (km)	8-lane length/ GDP/capita (km/Rmb1,000)	Target 8-lane length /GDP/capita (km/Rmb1,000)	8-lane increase (km)	8-lane total (km)
Anhui	325	5.2	7.9	4.7	5.9	128	453
Beijing	371	17.1	22.7	5.1	7.3	141	512
Chongqing	110	3.6	5.6	1.3	2.7	86	196
Fujian	645	16.5	20.4	12.6	19.3	245	890
Gansu	58	2.2	4.4	0.4	1.8	115	173
Guangdong	1,980	17.7	25.5	48.3	50	471	2,451
Guangxi	176	3.6	6.3	2.8	4.5	122	298
Guizhou	58	1.6	2.7	1.4	3.2	59	117
Hainan	18	1.9	3.2	0.6	2.2	29	47
Hebei	1,549	20.6	34.2	27.2	47.9	1,102	2,651
Heilongjiang	238	6.3	10.4	5.3	8.5	151	389
Henan	1,934	20.2	28.5	15.5	26.7	1,098	3,032
Hubei	170	2.9	4.9	2.0	3.7	128	298
Hunan	149	2.2	3.7	3.9	5.3	80	229
Inner Mongolia	876	34.8	46.5	21.9	36.8	446	1,322
Jiangsu	1,033	12.9	17.7	18.4	31.7	566	1,599
Jiangxi	275	6.0	9.1	5.6	10.0	178	453
Jilin	243	8.9	14.9	4.8	6.6	129	372
Liaoning	1,661	38.0	54.9	47.5	48.3	384	2,045
Ningxia	149	21.8	36.7	3.2	4.9	89	238
Qinghai	7	1.2	2.4	0.1	1.0	31	38
Shaanxi	946	24.7	39.7	21.0	33.8	576	1,522
Shandong	1,095	10.9	16.4	24.3	41.0	649	1,744
Shanghai	752	31.1	42.6	6.3	11.5	449	1,201
Shanxi	283	7.6	11.9	2.6	4.1	155	438
Sichuan	415	5.0	7.0	8.6	15.2	240	655
Tianjin	855	54.9	60.0	9.2	17.4	419	1,274
Tibet	0	0.0	1.6	0.0	0.7	17	17
Xinjiang	7	0.3	2.0	0.1	1.4	50	57
Yunnan	371	7.8	13.4	8.6	13.2	232	603
Zhejiang	804	14.2	19.0	14.6	21.4	322	1,126
Total	17,553					8,887	26,440

Source: UBS Evidence Lab, UBS-S estimates

We use the lower value of the two benchmark metrics for each province to compute the downside 8-lane highway length, and use the higher value of the two metrics to compute the upside 8-lane highway length. The lengths of 8-lane highways are 29,139km/26,440km/23,741km for our upside/base/downside scenario. The average highway lane rises to 4.64km/4.60km/4.56km in the three scenarios, compared with 4.43km by the end of 2017.

Figure 14: Scenario analysis of 8-lane increases

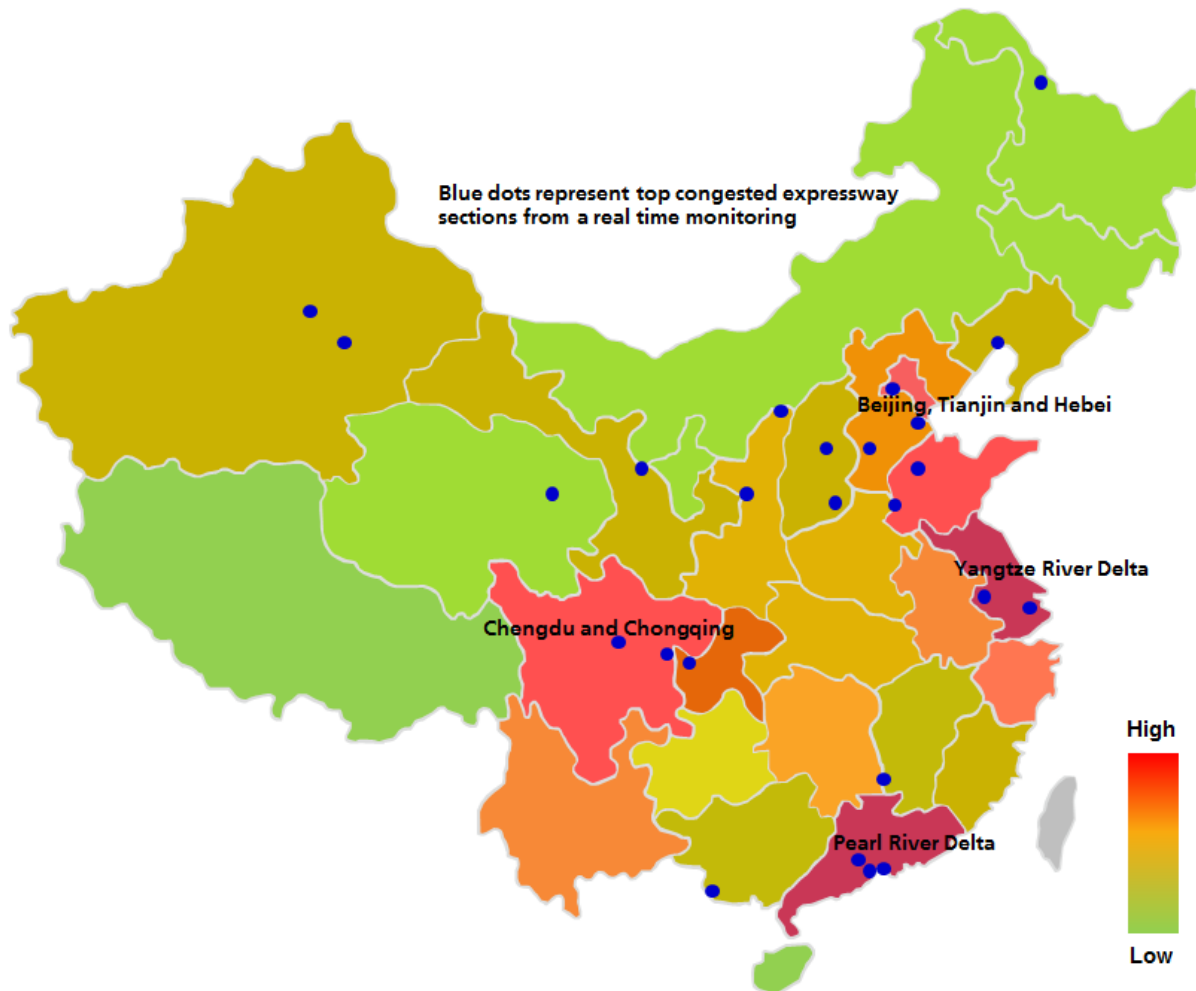
	Upside scenario	Base case	Downside scenario
Average 8-lane/capita (km)	21.0	19.1	17.1
Average 8-lane/GDP/capita (km/Rmb1,000)	15.2	13.8	12.4
8-lane highway total (km)	29,139	26,440	23,741
8-lane highway increase (km)	11,586	8,887	6,188

Source: UBS Evidence Lab, UBS-S estimates

Why is expansion needed?

We identify the 100 most congested highways in China at a specific time during the peak travel period (Saturday evening). We estimate that the total length of congestion amounts to more than 400km, and the average speed at these road sections could drop to less than 20km/hour, almost one-fifth of the normal highway speed.

Figure 15: Congestion level map



Note: Blue dots indicate the most congested expressways. Source: Baidu, Gaode, Google, UBS-S estimates

Combined with UBS Evidence Lab's map of lane category distribution, we find that even 8-lane highways can be congested. We think many 4-lane highways may require expansion in the next few years.

Figure 16: Distribution of lane categories

China Industrial: Highways Expansion

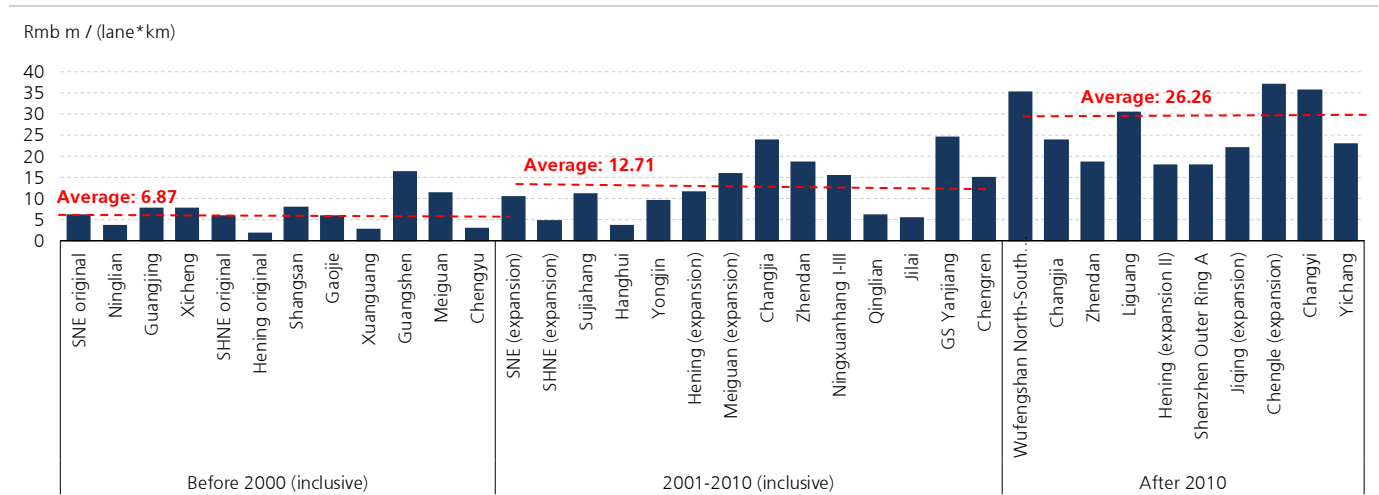


Note: UBS Evidence Lab classifies a road based on the number of lanes in each direction, ie, 4-lane here refers to 8-lane roads.
Source: UBS Evidence Lab

Is expansion very costly?

We track the cost per unit of expansion from before 2000 to after 2010. We find an upward trend.

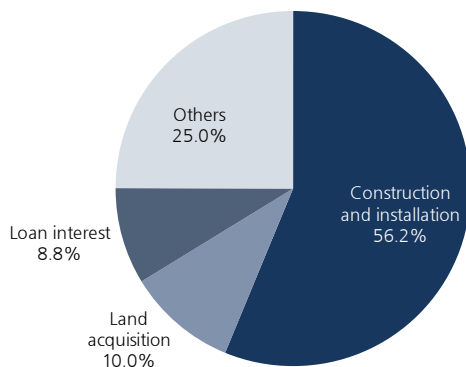
Figure 17: Cost of newly built/expansion per lane per km



Source: Company data, UBS-S estimates

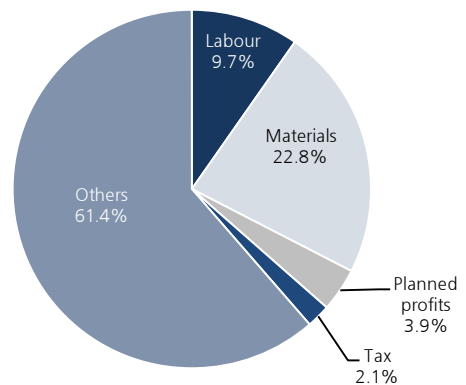
The Jiqing expansion in Shandong province (construction started in 2016 and is scheduled to be completed in 2019) provides a picture of the cost structure. The expansion cost is Rmb31bn (Rmb24.9m/lane*km), of which 56% comes from construction and installation. Land acquisition accounts for 10%, and capitalised interest accounts for 9%.

Figure 18: Cost breakdown of Jiqing expansion



Source: Feasibility analysis of Jiqing expansion by the Shandong Provincial Communications Planning and Design Institute

Figure 19: Breakdown of construction and installation cost



Source: Feasibility analysis of Jiqing expansion by the Shandong Provincial Communications Planning and Design Institute

Companies' exposure to highway expansion

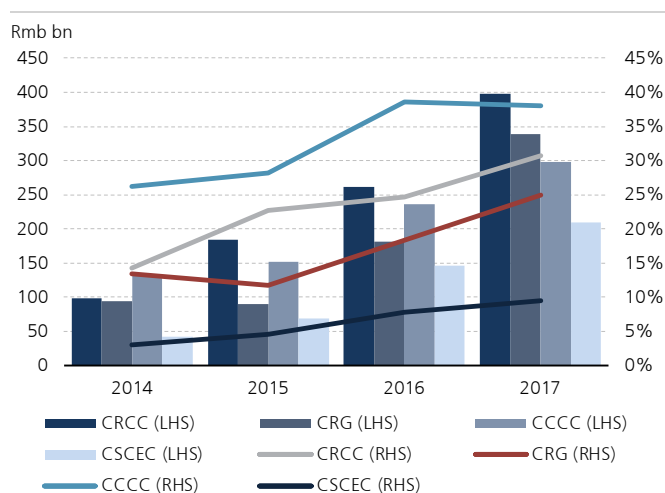
Among major listed Chinese transport construction companies, CRCC has the largest exposure in terms of highway new contracts in 2017, followed by CRG, China Communications Construction Company (CCCC) and China State Construction Engineering Corporation (CSCEC).

Figure 20: Breakdown of highway new contract market

Rmb bn		Q118	2017
CRCC	Overall construction new contracts	237	1293
	Road	63	398
CRG	Overall construction new contracts	229	1355
	Highway	39	339
CCCC	Overall construction new contracts	154	783
	Road and bridge	61	298
CSCEC	Overall construction new contracts	538	2212
	Road and bridge & Highway		210
Summary	Aggregated new contracts	619	5643
	Highway	163	1245

Source: Company data

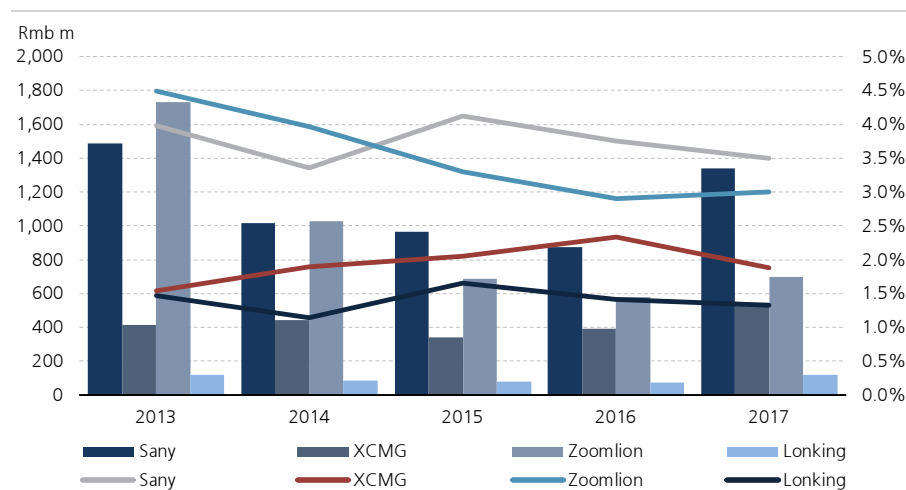
Figure 21: New contracts of major construction firms and their share of overall construction new contract



Source: Company data

Sany, among major construction machinery manufacturers, has much higher exposure to road machinery than its peers. Refer to our China construction machinery sector note, [Likely higher infrastructure investment may lift short-term sentiment; Sany is biggest beneficiary](#) (30 July 2018).

Figure 22: Major construction machinery firms' road machinery revenue, and as a share of the companies' overall revenue



Note: The lines indicate road machinery revenue as a share of respective companies' total revenue.
Source: Company data

PPP to provide financing support

According to current policy, local governments cannot spend more than 10% of their general public budget expenditure on PPP, hence restricting local governments' ability to participate in PPP, either through equity investment or various types of subsidies. If the above-mentioned restriction could be lifted (either through more local government budget items being included in the base calculation and/or a raised percentage), we believe local governments would have more room to invest in PPP. Our sensitivity analysis below indicates potential upside in local governments' net investment in PPP.

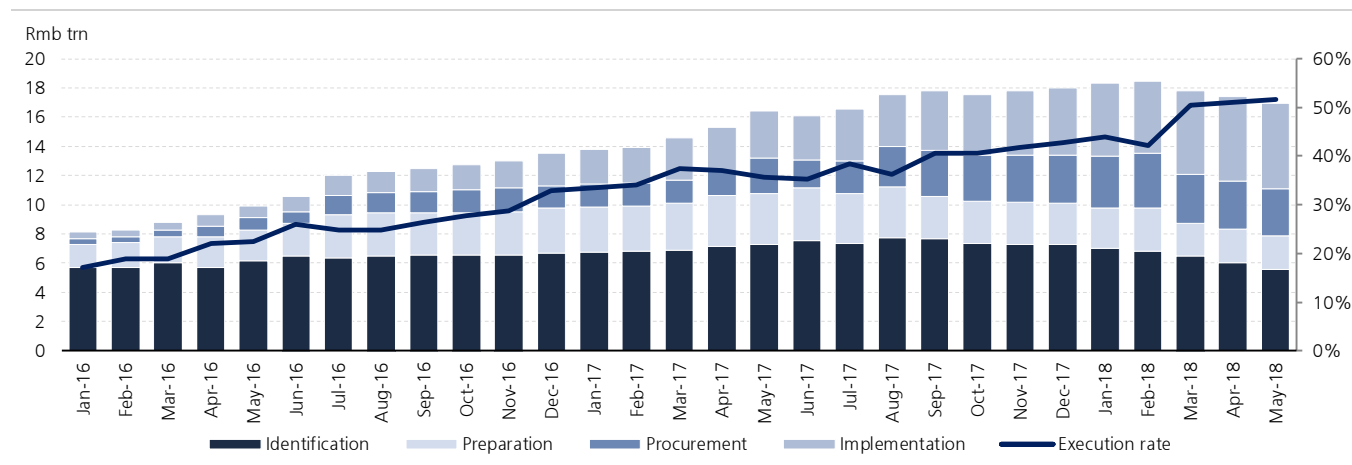
Figure 24: Scenario analysis of local governments' exposure to PPP projects

Budget growth rate	(Rmb trn) Local government budget	PPP as % of aggregated local government budget					
		10%	12%	14%	16%	18%	20%
-10%	15.6	1.6	1.9	2.2	2.5	2.8	3.1
0%	17.3	1.7	2.1	2.4	2.8	3.1	3.5
10%	19.0	1.9	2.3	2.7	3.0	3.4	3.8
12%	19.4	1.9	2.3	2.7	3.1	3.5	3.9
15%	20	2.0	2.4	2.8	3.2	3.6	4.0
20%	20.8	2.1	2.5	2.9	3.3	3.7	4.2

Source: UBS-S estimates

The market seems to be overly concerned about the recent round of PPP clean-up. As shown in the chart below, the MoF project library had 12,566 PPP projects totalling Rmb16.9trn as at end-May 2018, after weeding out all non-compliant projects. The actual execution rate has been increasing steadily and surpassed 50% in March 2018.

Figure 25: Investment size of PPP projects in the MoF project library



Source: MoF

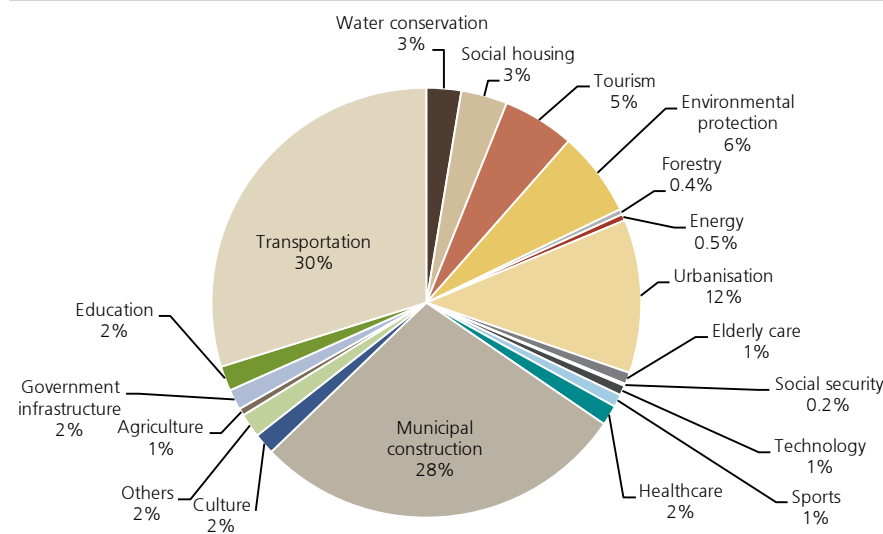
Transportation remained the largest sector in terms of the value of projects included in the PPP library as of May 2018. The water conservation and environmental protection sectors, where more and more construction companies are getting involved, are increasingly salient, accounting for 3% and 6% of the total investment size of PPP projects, respectively, as of May 2018.

Figure 23: Aggregated local government budget

Rmb trn	2017
Local governments' general public budget expenditure	17.3
Local government-managed funds expenditure	5.8
Local governments' state capital operating expenditure	0.1
Social insurance fund budget	4.9
Aggregate	28

Source: MoF

Figure 26: PPP project value by sector, May 2018

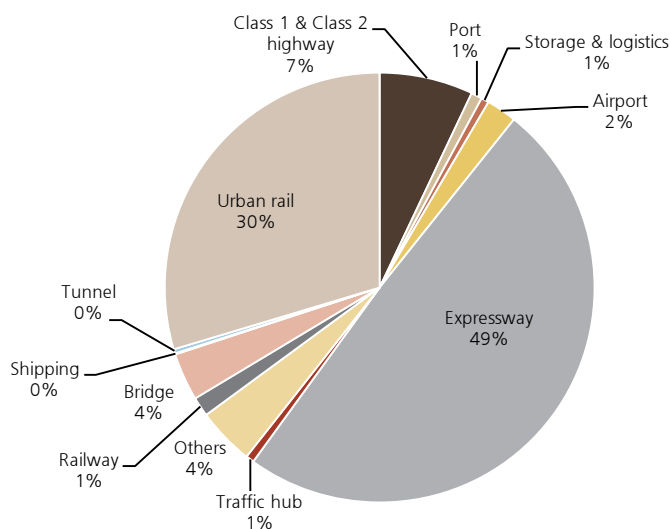


Source: MoF

Furthermore, among all demonstration projects in the MoF PPP library, highway PPP projects (including Class 1 and 2 highways, expressways, bridges, and tunnels based on the Ministry of Transport's definitions) represented 27.3%, with a total value of about Rmb755bn. The investment size of demonstration projects accounted for 16.3% of the total investment size of all PPP projects (as of March 2018), which theoretically enables the total value of highway PPP to reach Rmb4.5trn by our calculation.

Although the overall growth of PPP could slow, due to strict government policies, we believe there is scope for major construction firms to elbow out unqualified competitors to gain more market share. Higher entry barriers should mitigate receivable risks. All remaining projects, at least 20% of which are highway projects, have passed required tests, suggesting certain future investment.

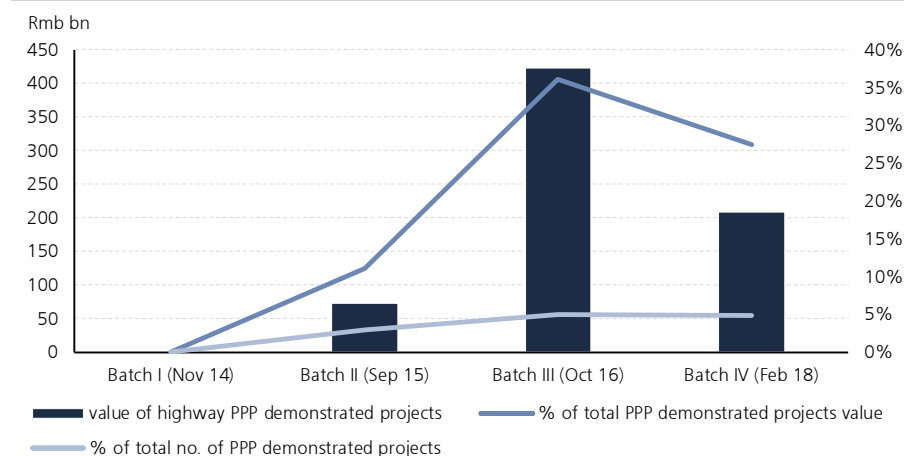
Figure 27: Breakdown of transportation-related PPP demonstration projects, May 2018



Source: MoF

The total investment value of highway projects has risen from zero for the first batch of PPP in 2014 to Rmb423bn for the third batch in 2016, albeit down slightly with Batch IV following the MoF's PPP library clean-up, completed at the end of March 2018. Notwithstanding tightening policies, highway projects have remained high in number terms and as a percentage of projects in the MoF's PPP project database.

Figure 28: Highway PPP projects represented a large portion of total PPP projects, in terms of investment size and number of projects



Source: MoF

**UBS Evidence Lab provides our research analysts with rigorous primary research. The team conducts representative surveys of key sector decision-makers, mines the Internet, systematically collects observable data, and pulls information from other innovative sources. They apply a variety of advanced analytic techniques to derive insights from the data collected. This valuable resource supplies UBS analysts with differentiated information to support their forecasts and recommendations—in turn enhancing our ability to serve the needs of our clients.*

UBS Evidence Lab analyses large geospatial datasets of China's full street network, covering over 5m km of public roads. It has created a regional roads footprint model on 31 provinces and 343 cities, including different kinds of roads. The classification of roads is based on three parameters: Functional Class, Lane Category and Area Type. Additionally, population data from the Socioeconomic Data and Applications Center* (SEDAC) are presented, as population is the most important factor in terms of traffic generation.

Functional Class

Functional Class defines a hierarchy of roads, from the biggest ones with the heaviest traffic and speed limits, such as highways, to local roads.

- Functional Class 1: roads that allow high-volume, maximum-speed traffic movement between and through major metropolitan areas. These roads have very few, if any, speed changes. Access to these roads is usually controlled.
- Functional Class 2: roads that are used to channel traffic to Functional Class 1 roads for travel between and through cities in the shortest amount of time. Functional Class 2 roads have very few, if any, speed changes, allowing for high-volume, high-speed traffic movement.
- Functional Class 3: roads that interconnect Functional Class 2 roads and provide a high volume of traffic movement at a lower level of mobility than Functional Class 2 roads.

- Functional Class 4: roads that allow a high volume of traffic movement at moderate speeds between neighbourhoods. These roads connect with higher Functional Class roads to collect and distribute traffic between neighbourhoods.
- Functional Class 5: roads on which volume and traffic movement are below the levels of any functional class. In addition, walkways, truck-only roads, bus-only roads, and emergency vehicle-only roads are classified as Functional Class 5.

Lane Category

This classifies a road based on the number of lanes in each direction.

- 1 – One lane
- 2 – Two or three Lanes
- 3 – Four or more lanes

Area Type

This defines whether a road is located in urban area or not.

* Detailed information can be found at: <http://sedac.ciesin.columbia.edu/data/set/gpw-v4-population-density-adjusted-to-2015-unwpp-country-totals-rev10>

China Industrial: Highways Expansion



UBS Evidence Lab's 8-lane Highway Length Model: UBS Evidence Lab's data science team has developed a linear regression model on provincial 8-lane highway length. The model captures and quantifies the relationships between provincial 8-lane highway length and factors such as 2017 population, 2017 GDP per capita and coastal/inland indicators for each province.

Valuation Method and Risk Statement

We use PE methodology to derive the price targets of the Chinese construction firms covered by UBSS.

Given infrastructure projects are initiated by the government, investment downsizing at the macro level remains a key risk to China's construction sector. Raw material and labour costs could hurt contractors' profitability should prices go up sharply. Revenue from overseas projects is principally denominated in foreign currencies, which could expose companies to the renminbi appreciation risk. The overseas businesses of Chinese construction companies face geopolitical risks.

We use P/BV targets to value Chinese construction machinery firms we cover.

Upside risks: 1) property and infrastructure investment growing faster than expected, helped by policies; 2) stronger-than-expected replacement demand if equipment retirement exceeds expectations; 3) policy support for domestic brands; 4) early resolution of overcapacity, if smaller manufacturers quickly exit the market; 5) the government comes out with stricter policy on environmental protection, which speed up the retirement of old machineries.

Downside risks: 1) property and infrastructure investment growing slower than expected, due to government policies; 2) weaker-than-expected replacement demand; 3) overseas sales being impacted, if trade friction intensifies; and 4) slower-than-expected resolution of overcapacity, if smaller players take a long time to exit the market.

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Neutral	FSR is between -6% and 6% of the MRA.	37%	21%
Sell	FSR is > 6% below the MRA.	15%	13%
Short-Term Rating	Definition	Coverage ³	IB Services ⁴
Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

Source: UBS. Rating allocations are as of 30 June 2018.

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China Railway Construction ^{5, 16}	1186.HK	Buy	N/A	HK\$9.22	27 Jul 2018
China Railway Group ^{5, 16}	0390.HK	Buy	N/A	HK\$6.70	27 Jul 2018
Jiangsu Hengli Hydraulic	601100.SS	Buy	N/A	Rmb24.21	27 Jul 2018
Sany Heavy Industry	600031.SS	Buy	N/A	Rmb8.97	27 Jul 2018
Zoomlion Heavy Industry Science & Tech-H	1157.HK	Sell	N/A	HK\$3.22	27 Jul 2018

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