

# UBS Investment Research

## Asian Structural Themes – High Speed Rail

### Fast trains rather than cars or planes

#### ■ High speed rail has significant advantages over air

High speed rail (HSR) services are officially defined as rail services that run at top speeds of at least 250km/h. High speed rail services offer faster speeds than air travel for trips of up to ~900km, with lower cost, greater convenience, greater reliability and lower carbon emissions.

#### ■ Large high speed rail plans in Asia

By 2014 China plans to have the largest HSR network in the world, with ~19,000 km of track connecting ~200m people. Korea (35m), Singapore/Malaysia (13.2m), Taiwan (9.6m), and Thailand (9.2m) all also are planning to connect significant numbers of people with high speed trains. And Indian Railways has published a vision to connect cities with a combined ~147m people by 2020.

#### ■ Key impacts are on airlines and gaming

Gaming in Singapore and Macau (if 'local' population is defined as those within ~3.5hrs road/rail travel, HSR will increase Macau's 'local' population by up to 69% and Singapore's by ~30%); Airlines (HSR routes of up to 4 hours pose greatest risk to airlines); HSR infrastructure (high speed trains, constructors and operators of the networks, and steel suppliers); Real estate developers (redevelopment of land around stations for business parks, retail and residential around the new high speed train stations; increased real estate demand in lower tier cities); Carbon (cars and airplanes emit 8x and 11x as much CO2 per passenger Km, respectively, as rail); Lodging (more people moving around the country as easier, lower cost than airlines, and faster than other alternatives).

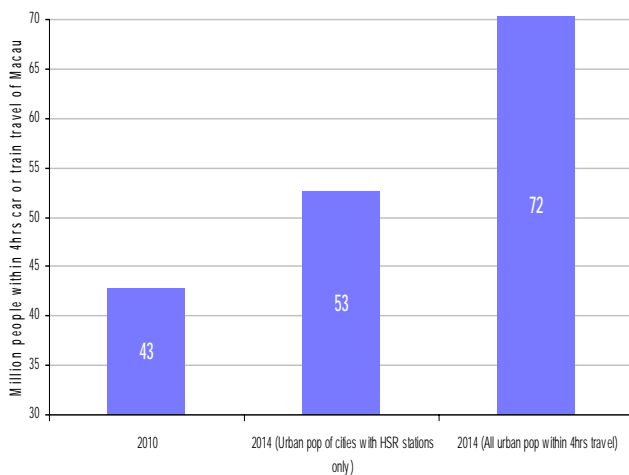
8 July 2010

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Simon Smiles

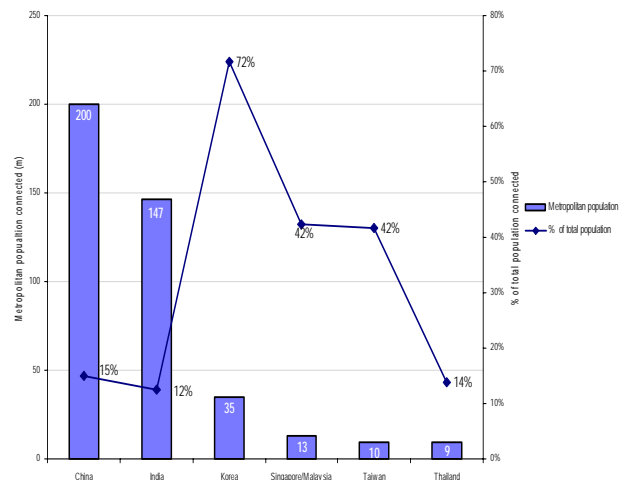
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Macau's 'local' population – 2010 and 2014



Source: Chinese Ministry of Rail, citypopulation.de, Google Earth, UBS estimates

Metropolitan populations connected by planned HSR



Source: citypopulation.de, CIA Factbook, National railway bodies, UBS estimates

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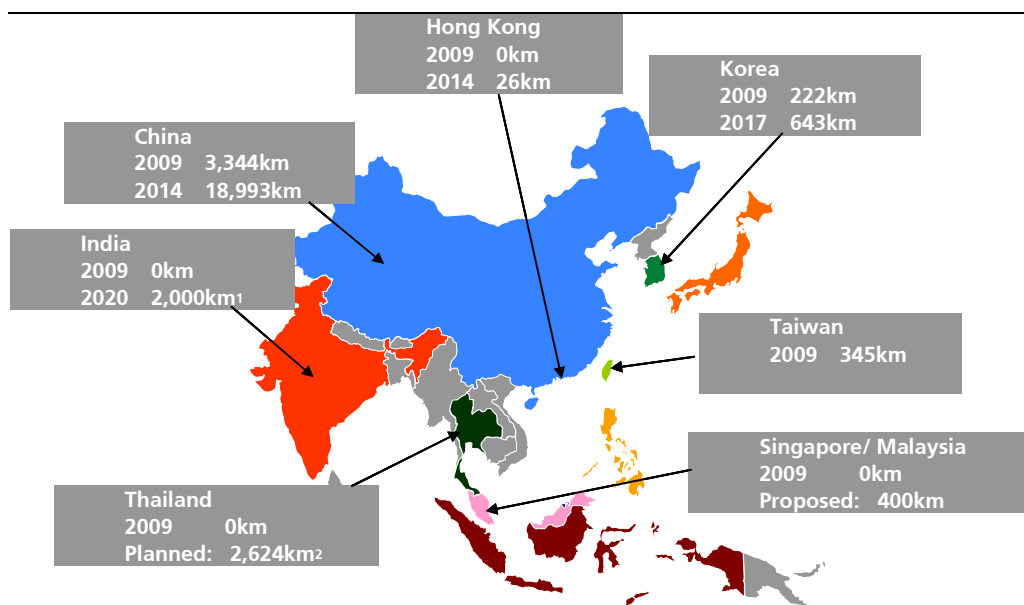
## What is hi speed rail?

High speed rail (HSR) services are officially defined as rail services that run at top speeds of at least 250km/h. They use continuous welded rail which reduces track vibrations and discrepancies between rail segments. And almost all are also electrically driven via overhead lines.

Advantages of HSR over cars	Advantages of HSR over airplanes
<ul style="list-style-type: none"> <li>■ <b>It is faster.</b> The lower limit for HSR (250 km/h) is substantially faster than the highest road speed limit in most countries.</li> <li>■ <b>Avoids traffic congestion-related delays</b></li> <li>■ <b>Train tracks permit a far higher throughput of passengers per hour than a road the same width.</b> The typical passenger rail carries 2.8x as many passengers per hour per metre (width) as a road. Congestion also causes the maximum throughput of a road lane to decrease</li> <li>■ <b>Much lower carbon emissions.</b> Per passenger-Km cars emit 8x more CO2 than rail.</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Speed for trips of 2-3 hours (250-900km).</b> Airlines suffer from time taken to arrive at the airport (which is generally located outside city centres rather than in the city centre like train station), check in, go through security screening, board, taxi, disembark, and retrieve baggage.</li> <li>■ <b>Cost</b> – Trains are much cheaper to operate and average train tickets are typically lower than comparable airplane tickets.</li> <li>■ <b>Greater convenience</b> - no requirement to check baggage, or repeated queuing for check in, security and boarding.</li> <li>■ <b>Typically higher on-time reliability.</b> And rail travel is also typically less weather dependent than air travel. If the rail system is well-designed and well-operated, severe weather conditions such as heavy snow, heavy fog, and storms do not affect the journeys; whereas flights are generally cancelled or delayed under these conditions</li> <li>■ <b>Much lower carbon emissions.</b> Per passenger-Km airplanes emit 11x more CO2 than rail.</li> </ul>

## Asian plans for HSR

Figure 1: Current and planned HSR networks



<sup>1</sup> Possible future plans based on India Railways' 2020 Vision report. <sup>2</sup> Thai Ministry of Transport plans. Source: Various

## What it means for the way people travel

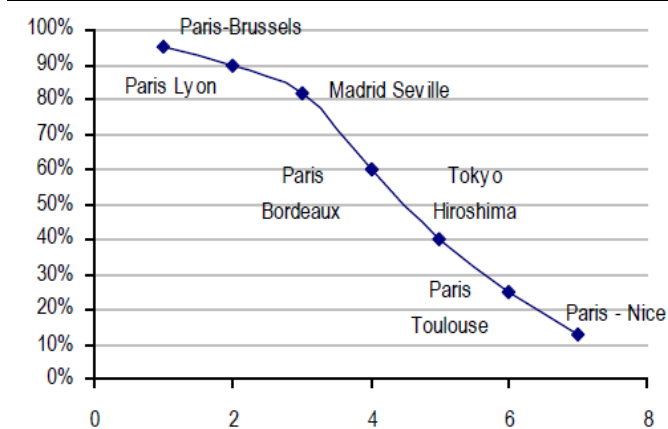
Our European transport analysts Jarrod Castle and Dominic Edridge wrote an interesting Q-Series report in January 2010.

They found that the impact of HSR on airlines has thus far generally been very negative. For instance, in Spain, the impact of HSR on air travel between Madrid and Seville has been severe: within six months of an HSR link opening, the number of weekly flights between two cities fell from 71 to 40, and the airlines lost more than 20% of market share in a year (COST 318 “Interaction Between High Speed Rail and Air Passenger Transport” European Commission, Directorate-General of Transport, final report, Luxembourg, 1998).

And this was not a one-off. The BBVA Foundation estimated that since HSR was introduced, the market share of air fell by 25% on the Paris-Lyon route (31% in 1980 to 6% in 1997), 32% on Madrid to Seville (40% in 1991 to 8% in 2002), and 6% on Hamburg-Frankfurt (10% in 1985 to 4% in 2000). HSR’s market share has risen from 0% to 70%, 61% and 48%, respectively, on these three routes.

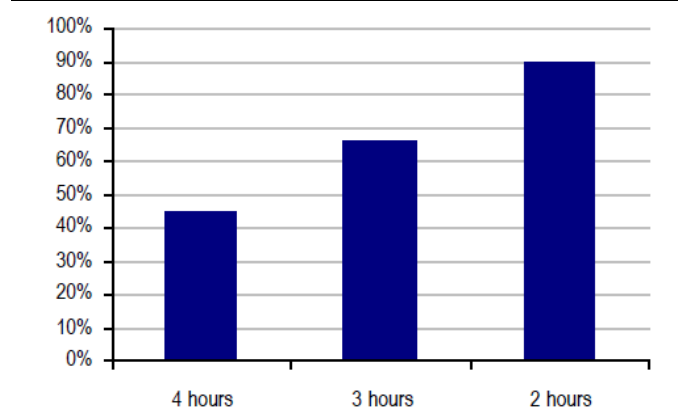
In terms of drivers of market share, Jarrod and Dominic highlighted that studies have found that rail journey time is the single most important factor in determining rail market share. Specifically, the longer an HSR journey takes the lower the market share relative to air. The two charts below are extracted from their report.

Chart 1: Rail journey length (hrs) vs. market share



Source: European Commission – Transport

Chart 2: TGV French market share vs. air, by journey time



Source: UIC

## Key implications

### 1) Airlines

Our European analysts highlighted air routes competing with HSR routes of up to 4 hours as most at risk in Europe. However, given our own experiences of airport delays, the length of travel that HSR in China will hold advantages over airlines may be longer. According to the CAAC, 23% of all plane flights in China in April 2010 were delayed.

### 2) Gaming in Singapore and Macau

While Las Vegas visitors tend to stay for holidays, with an average stay of 3.6 nights and 99% of people staying for at least 1 night, the majority of Macau’s

gamblers are ‘locals’ drawn from cities within 3/4 hours travel of Macau. 51% of Macau’s gamblers are day trippers, with average length of stay of 1.4 nights. UBS Macau gaming analysts Grant Chum and Gary Ngan estimate that there are 43m people living in urban areas within 3/4 hours of road or ferry trip from Macau (including 7m in Hong Kong, 8.8m in Shenzhen and 9.5m in Guangzhou).

- China’s planned new HSR network will result in 10m more people from urban areas with HSR stations being within 4 hours train travel of Macau by 2014, increasing the ‘local’ Macau population by 23%.
- The 200km/hr Guangzhou-Zhuhai rail link, while not strictly defined as HSR, will effectively result in Guangzhou’s entire population (along with the populations of Xiamen and Guiyang) being within 4 hours combined road and rail travel of Macau. Using this definition, Macau’s ‘local’ population would increase by 69%.
- The Guangzhou-Zhuhai link will also cut the transit time for urban residents in Guangzhou, which makes up 22% of the current ‘local’ Macau population. The trip currently takes at least 2 hours by road. Once the rail link is completed, they will be within ~45 minutes of Macau (‘guaranteed’ ~30 minute train ride and less than 15 minutes drive from Zhuhai to Macau).

**Table 1: New ‘local’ Macau population**

City	Definition 1 - Urban population in cities with HSR stations within 4 hours of Macau	Definition 2 – All people within 4 hours combined road and rail travel of Macau
Guiyang	2.7	2.7
Huizhou	2.2	na
Qingyuan	1.4	na
Xiamen	1.7	1.7
Zhaoqing	1.8	na
Guangdong province	na	25.2
<b>Total</b>	<b>9.8</b>	<b>29.6</b>
Current ‘local’ population	42.8	42.8
% increase	+23%	+69%

Source: Chinese Ministry of Rail, [www.citypopulation.de](http://www.citypopulation.de), various local statistics bureaus, UBS estimates

The implications for Singapore’s new casinos could also be significant. Singapore’s current ‘local’ population is ~6.2m (4.9m in Singapore proper and 1.3m urbanites in nearby Johor). If the proposed high speed rail network is built, an additional 1.9m urban from Kuala Lumpur will be within 90 minutes train ride, an increase of ~30% in Singapore’s ‘local’ population.

### 3) Railway operators

Interestingly, despite potentially winning significant share from other modes of transport, HSR may actually offer very poor returns for operators given its high investment costs. In a companion note published today (*Go high-speed, rolling stock boom*) UBS co-head of Asian transport research Richard Wei forecasts that China’s Wuguang high-speed line will only make a ROE of 10% until 2019.

#### 4) High speed railway infrastructure

Rail track weighs 64.5kg per metre and there are two rail lines so twice the total length of track is required. Rail track is made of steel. And there are ~1.6t of iron ore per tonne of steel. So we can calculate the iron ore needed to build the tracks the (non-magnetic) HSR trains will run on at ~1.6m tonnes.

And this does not include the steel needed to construct associated infrastructure such as bridges, tunnels, etc

#### 5) High speed train and components manufacturers

Current suppliers of high speed trains to Asian developments include; Siemens (Beijing to Tianjin), Train a Grande Vitesse (TGV, Korea's existing network), Korea Railroad Research Institute (Korea's planned Mokpo line), Kawasaki (Taiwan) and China North Locomotive (CNR state-owned company supplying trains for planned Shanghai to Beijing. China South Locomotive (CSR) also makes trains and Zhuzhou CSR provides HSR components in China. Zhuzhou CSR is highlighted as the biggest beneficiary of Chinese railway investment in Richard Wei's '*Go high-speed, rolling stock boom*' companion note published today.

#### 6) Railway constructors and suppliers

Constructors and suppliers of planned HSR networks in Asian include; SYSTRA (Korea), ABB, Hollysys Automation Technology, Ansaldo STS, CCC (all China), China Railway Construction (40% of Shanghai to Beijing in China), and China Railway Group (26% of Shanghai to Beijing in China).

#### 7) Real estate developers

There may be substantial opportunities for redevelopment of land around the new HSR train stations for business parks, retail and residential estates.

#### 8) Real estate demand in lower tier cities

Businesses are likely to increasingly be relocated further inland in China to areas newly accessed by HSR which have lower labour and land costs than coastal areas. This will lead to increased wages and potentially more equal wealth distribution.

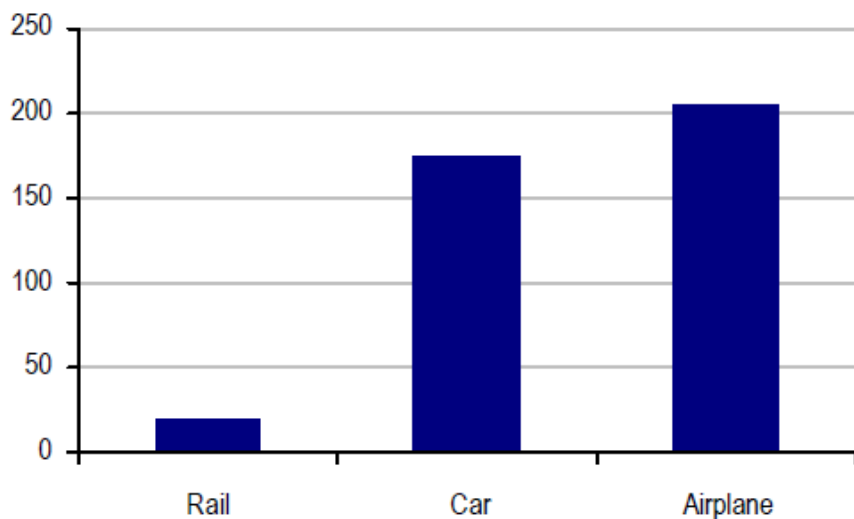
#### 9) Lodging, particularly in China.

More people will potentially move around the country as HSR is easier and lower cost than airlines, and much faster than other alternatives. This is particularly relevant for China where many workers live away from their families and typically only take one holiday a year during Golden week.

#### 10) Carbon

Most HSR trains are run on electricity, but even using electricity generated from coal or oil, trains are more fuel efficient per passenger per km travelled than the typical automobile because of economies of scale in generator technology. According to OBB's sustainability report, cars and airplanes emit 8x and 11x as much CO<sub>2</sub> per passenger Km, respectively, as rail (although the exact ratios will depend on the fuel mix used to generate electricity).

Chart 3: CO2 emissions in passenger transport 2008 (g/passenger Km)



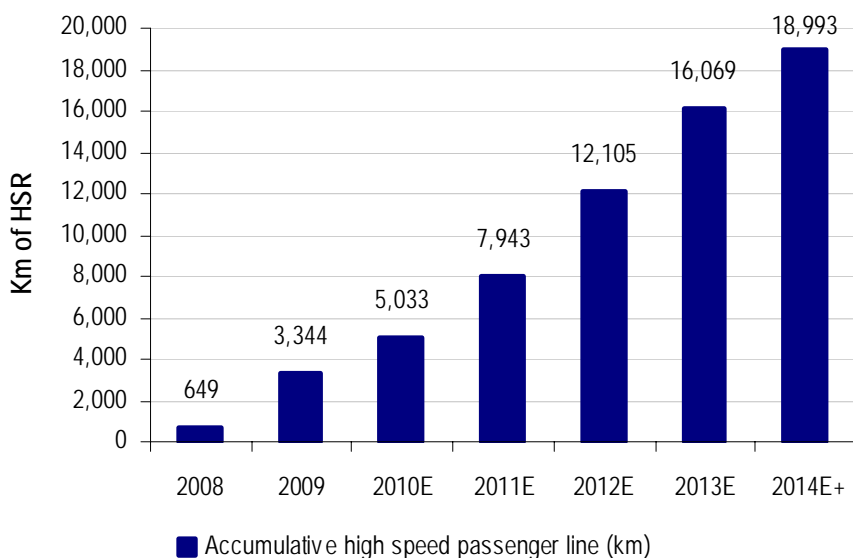
Source: OBB Sustainability report (annual report 2008)

## Country detail

### China

By 2014, China plans to have the largest HSR network in the world.

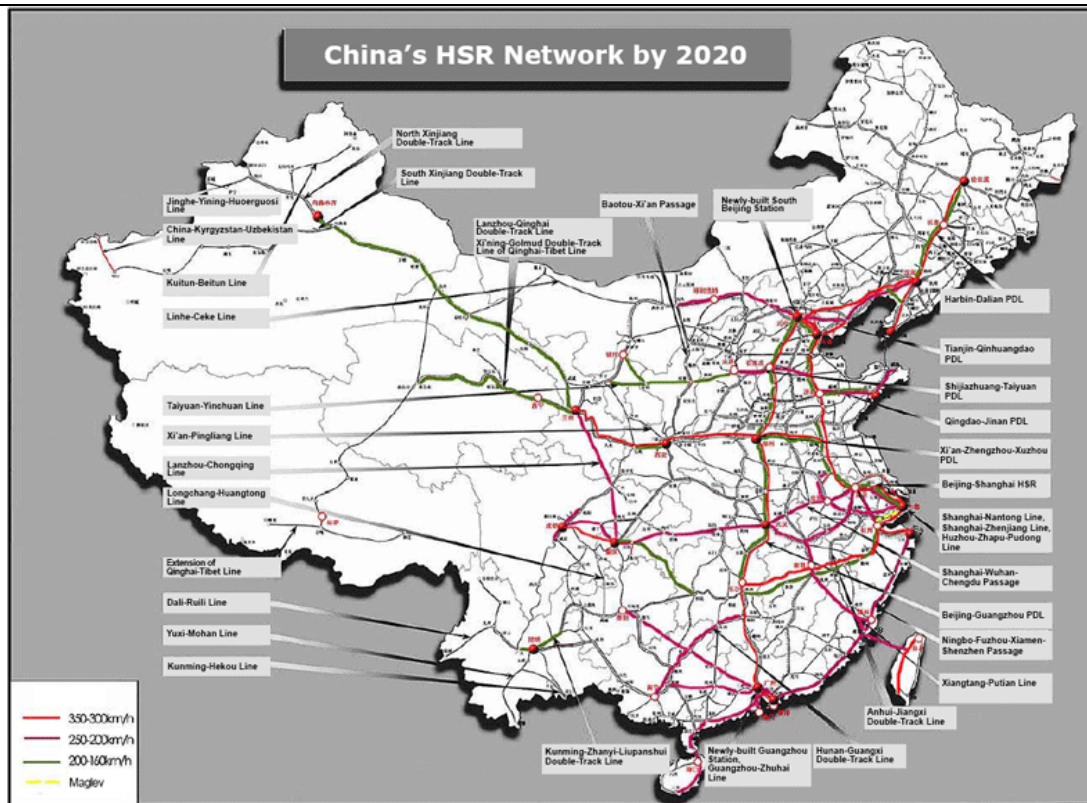
Chart 4: Chinese HSR passenger dedicated rail line\*



\*Figures shown are for track capable of at least 250km/hr, in line with international definitions of HSR. Please note China Ministry of Rail aggregate figures also include tracks capable of 200km. Source: Chinese Ministry of Rail, UBS estimates

Most of China’s HSR network plans to use conventional track rather than maglev (a technology that uses powerful magnets to float a wheel-less train just above the track).

Figure 2: China’s HSR network by 2020



Source: nextbigfuture.com

UBS co-head of Asian transport research Richard Wei’s companion note ‘Go high-speed, rolling stock boom’, published today, provides further detail on China’s HSR plans and the implications for Chinese rolling stock, rail operator, and railway construction companies.

### Hong Kong

The Hong Kong section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link will include one station and a 26 km tunnel to connect the territory with China’s HSR network. It will run entirely underground and is designed for a maximum speed of 200 km/h. However, funding is still pending approval by the SAR’s government.

### India

Indian Railways in its Vision 2020 statement proposed a plan to build 2,000km of HSR by 2020 costing INR2,000bn (US\$44.5bn). The plan is based on a public and private partnership model with state governments, including real estate development.

It includes at least 4 high-speed rail projects to provide HSR train services at 250-350 km/hr, with further planning for at least 8 more corridors connecting commercial, tourist and pilgrimage hubs. Six potential corridors that are highlighted by India Railways are Delhi-Chandigarh-Amritsar, Pune-Mumbai-Ahmedabad, Hyderabad-Dornakal-Vijayawada-Chennai, Howrah-Haldia, Chennai-Bangalore-Coimbatore-Ernakulam, & Delhi-Agra-Lucknow-Varanasi-Patna

## Indonesia

A Hydrogen High-Speed Rail Super Highway (H2RSH) train to Jakarta Soekarno-Hatta International Airport is under construction and due for 2012 operation. However, there are no plans for intercity HSR over the next 10 years, as the current focus is on expanding metropolitan rail services.

## Korea

Korea's first high speed rail route opened in April 2004. It was 222 km and had a top speed of 300km/hr. It is being extended with Taegu to Pusan and Taegu to Taejon being added to the Seoul link, together making 412km of high speed rail. And the Mokpo High Speed Railway will add a further 231km between Osong and Kwangju (opening in 2015) and Kwangju and Mokpo (opening 2017).

## Singapore and Malaysia

For many years a HSR network linking Malaysia and Singapore has been proposed. But issues remained over the location of the Malaysian rail checkpoint and the use of Malayan Railway land, among other issues. However, on 24<sup>th</sup> of May 2010 an agreement regarding normal rail was finally announced by Singapore's PM Lee and Malaysia's PM Najib. The agreement also promises seamless integration into public transport on both sides of the causeway.

Six plots of land that the railway resides on, which currently belongs to Malayan Railway (i.e. Malaysia), will be transferred into a JV and jointly owned by Temasek Holdings (40%) and Khazanah (60%). The redevelopment potential is substantial, especially for the Tanjong Pagar (commercial activity), Woodlands (industrial) and Bukit Timah (residential/commercial/retail). And this could be a precursor to HSR development.

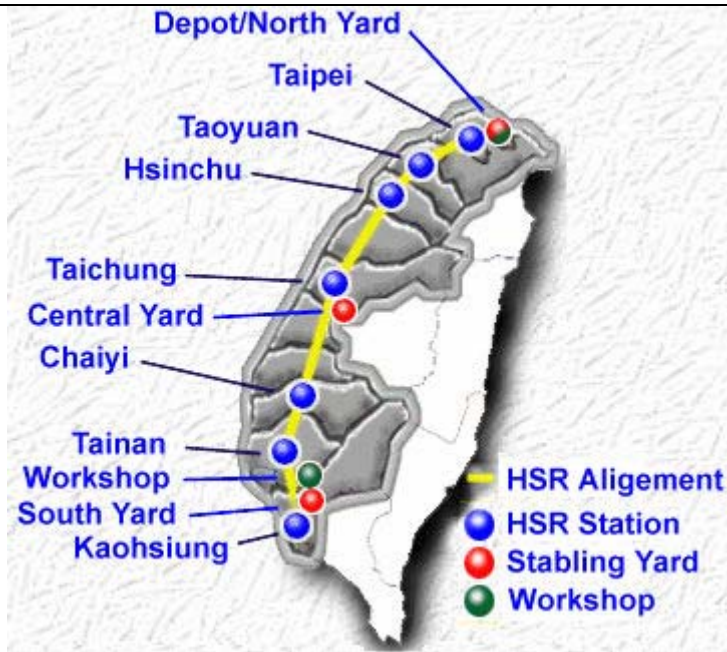
A HSR link would cut the travel time between Kuala Lumpur and Singapore to 90 minutes. It current takes 4 hours by car, 7 hours by standard rail, and at least 2 hours by air (including commuting to and from airport, check in and boarding).

The implications for Singapore's new casinos could also be significant. Singapore's current population is 4.9m and the nearby city of Johor in Malaysia has 1.3m urbanites. If the proposed high speed rail network is built, an additional 1.9m urban in Kuala Lumpur will be within 90 minutes train ride of Singapore's casinos, an increase of ~30% in Singapore's 'local' population.

## Taiwan

Taiwan has a high speed train network between Taipei and Kaohsiung that opened in January 2007. It covers 345km with a maximum speed of 300km per hour. Extensions to the Taiwan High Speed Rail are planned, including one extension to North Taipei (Nangang Station) and to central Kaohsiung (instead of Zuoying Station), but no timeframe has been confirmed.

Figure 3: Taiwan HSR Network



Source: railway-technology.com

### Thailand

The State Railway of Thailand and the Thai Ministry of Transport have plans for several HSR lines. In October 2009, press reports suggested that funding was being sought for four lines, linking Bangkok to Chiang Mai (711 km), Nong Khai (600 km), Chanthaburi (330 km), and Padang Besar (983 km) at a total cost of THB800bn (US\$25bn). In November 2009, MCOT reported that the Thai cabinet had approved the plan, with the shorter route to Chanthaburi to be the first line constructed.

### Vietnam

Reuters reported that Vietnam's national railway company, Vietnam Railways, has proposed a 1,630 km HSR link between Hanoi and Ho Chi Minh City, capable of running at 250 to 300 km/hr. The current train travel time of 33 hours would have been cut to 5hrs 38 minutes.

However, on June 19, 2010, VietNamNet Bridge reported that after a month of deliberation, Vietnam's National Assembly rejected the HSR proposal due to its high cost, and asked for further study of the project.

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We believe risks to equities include regional and global economies, interest rates, commodity prices, and many other factors. Forecasting corporate earnings is difficult because it is affected by a wide range of economic, financial, accounting and regulatory trends, as well as changes in tax policy. These factors could impact shares negatively.

The railway sector in China is highly regulated. We believe the main risks are tariffs and policy. Currently, both passenger fares and freight tariffs are tightly controlled by the MOR and China NDRC and are not easily changed. The main policy risk is that rail operators have no control over their own operations and are subject to intervention from the MOR.

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UBS 12-Month Rating	Rating Category	Coverage <sup>1</sup>	IB Services <sup>2</sup>
Buy	Buy	54%	41%
Neutral	Hold/Neutral	37%	32%
Sell	Sell	9%	24%
UBS Short-Term Rating	Rating Category	Coverage <sup>3</sup>	IB Services <sup>4</sup>
Buy	Buy	less than 1%	22%
Sell	Sell	less than 1%	0%

1:Percentage of companies under coverage globally within the 12-month rating category.

2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.

3:Percentage of companies under coverage globally within the Short-Term rating category.

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Source: UBS. Rating allocations are as of 30 June 2010.

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UBS Short-Term Rating	Definition
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Sell	Sell: Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.

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**Market Return Assumption (MRA)** is defined as the one-year local market interest rate plus 5% (a proxy for, and not a forecast of, the equity risk premium).

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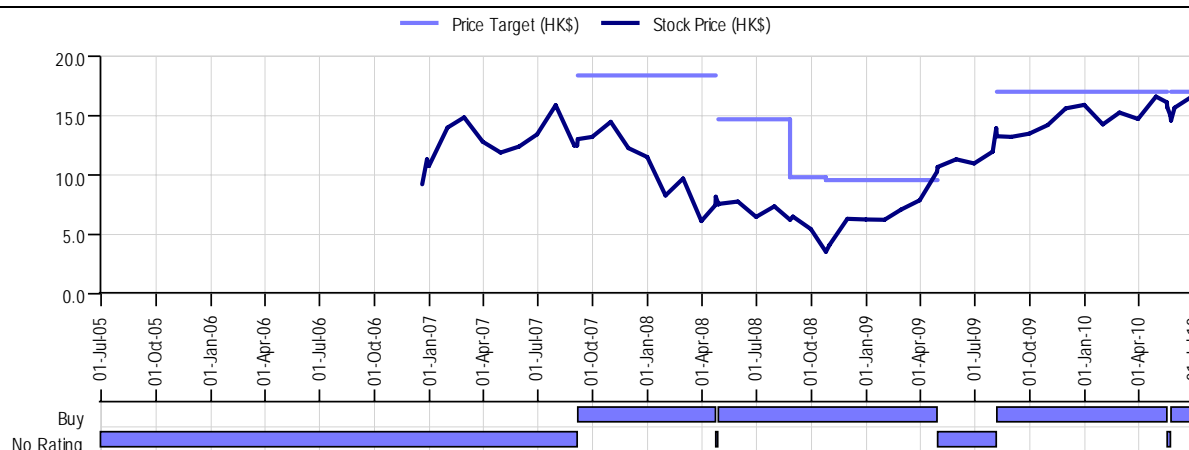
**Company Disclosures**

Company Name	Reuters	12-mo rating	Short-term rating	Price	Price date
Zhuzhou CSR Times Electric	3898.HK	Buy	N/A	HK\$17.54	08 Jul 2010

Source: UBS. All prices as of local market close.

Ratings in this table are the most current published ratings prior to this report. They may be more recent than the stock pricing date

Unless otherwise indicated, please refer to the Valuation and Risk sections within the body of this report.

**Zhuzhou CSR Times Electric (HK\$)**

Source: UBS; as of 08 Jul 2010



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