Magnetic Moments for Octahedral Metal-Ligand Complexes

We learned earlier in the semester that compounds with unpaired electrons are paramagnetic and generate a magnetic field. The strength of this field is reported as a magnetic moment, with larger magnetic moments corresponding to a greater number of unpaired electrons. The table below reports magnetic moments for metal-ligand complexes of first row transition metals, along with the valence shell electron configurations for the metals. Although the primary contribution to a compound's magnetic moment is the number of unpaired electrons, there are other contributing factors that depend on the metal's ligand(s); thus, magnetic moments are reported as ranges.

metal ion	electron configuration	range of magnetic moments
Sc(III)	[Ar]	0
Ti(IV)	[Ar]	0
Ti(III)	[Ar]$3d^1$	1.6–1.72
V(IV)	[Ar]$3d^1$	1.7–1.8
V(III)	[Ar]$3d^2$	2.7–2.9
Cr(III)	[Ar]$3d^3$	3.7–3.9
Cr(II)	[Ar]$3d^4$	3.0–3.3; 4.8–5.0
Mn(III)	[Ar]$3d^4$	3.0–3.3; 4.8–5.0
Mn(II)	[Ar]$3d^5$	2.0–2.5; 5.7–6.0
Fe(III)	[Ar]$3d^5$	2.0–2.5; 5.7–6.0
Fe(II)	[Ar]$3d^6$	0; 5.6–5.9
Co(III)	[Ar]$3d^6$	0; 5.6–5.9
Co(II)	[Ar]$3d^7$	2.0–2.7; 4.3–5.2
Ni(II)	[Ar]$3d^8$	2.9–3.3
Cu(II)	[Ar]$3d^9$	1.8–2.1
Cu(I)	[Ar]$3d^{10}$	0
Zn(II)	[Ar]$3d^{10}$	0

Discuss this data with those around you. What do you make of this data? What patterns do you see in this data? What questions does this data raise for you?